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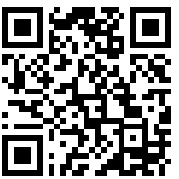

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MANUFACTURERS OF

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SAN FRANCISCO, 18 First Street
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TORONTO, 10 Shuter Street

PRINCIPAL FACTORY, CHICAGO

Ninth Edition *Price 50 Cents*

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INTRODUCTORY

IN offering this, the Ninth Edition of our Catalogue, we again thank our friends for their esteemed patronage, which has made it possible for us to still further enlarge our factories and various facilities for handling our constantly growing business.

The reputation, which we have maintained for nearly a quarter of a century, as conscientious manufacturers and distributers of modern goods for the profession, is continually widening; and, without any self-praise, we may say that our growth has been almost phenomenal. At the present time, our sales of many, if not all, of the lines we produce greatly exceed those of any other house in our line. Our success may be attributed to the fact that we have kept pace with the general growth and development of the country and earnestly endeavored to have every customer feel that we consider his interests as our own. We shall continue to follow the same progressive methods in the future, and our policy will always be to improve our goods where possible, supplying our patrons at the lowest prices consistent with first-class material and workmanship. While *all* our goods are of the best in their respective grades, we differ from some of our competitors in that we do not claim a monopoly of all high grade and reliable goods. We merely try to show in this catalogue the various points wherein our products excel.

Since the last issue of our general catalogue, we have opened new houses in Pittsburg, Pa., and in Toronto, Canada, also a sales office in Philadelphia, to better serve our many friends in those territories.

This Edition shows the complete line of instruments and material we regularly manufacture and keep in stock, but any special goods, Instruments of Precision, etc., will be made to order at the lowest prices consistent with careful and accurate workmanship.

To those who are as yet unacquainted with us or our line, we wish to say that all our goods are guaranteed to be exactly as described, and we respectfully solicit a trial order—this being the best means of proving that our goods are high grade and our prices reasonable.

Our goods may be procured from our large warerooms in CHICAGO, NEW YORK, SAN FRANCISCO, NEW ORLEANS, PITTSBURG, TORONTO or from the leading dealers in other cities of the United States, Canada, Mexico, and other countries.

In conclusion we wish to again thank our numerous patrons for their kind support in the past, and we hope, by our careful attention to their wants, to merit a continuance of same.

EUGENE DIETZGEN CO.

Chicago, July 1, 1910.

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NOTICE

ORDERING

In ordering, kindly give the Catalogue number, and in some instances—like papers—size, thickness, color, etc., or when ordering tapes, length in feet, etc. An omission of any of these important particulars often causes a delay of several days, in order that we may write and find out just what is wanted. If you have had the goods before and wish to order them again, repeat in your order the description of them as given in our bill, *or give date of bill.*

SHIPPING DIRECTIONS

State whether you wish your goods sent by express or freight, and if there is more than one route, designate which you prefer. Small packages or parcels weighing less than 50 to 60 pounds will be forwarded more safely, more expeditiously, and in most instances equally as cheap by express instead of freight.

Freight shipments usually require packing boxes, *which will be charged at cost.*

Small articles weighing one pound and less can be sent by express, prepaid; or by mail at one cent per ounce, and such charges will be added to the price of the goods. Registering mail matter lessens the risk of loss.

We cannot be responsible for goods lost or damaged in transmission by mail. When requested, we can have all mail packages, not exceeding $20.00 in value, insured against loss for a nominal charge.

In all cases where no shipping directions are given, we send goods according to our best judgment.

REMITTANCES

Remittances may be made either by bank draft payable to our order, or by post-office money order, or by cash sent by any of the express companies. If cash is forwarded by mail, the letter should be registered. When goods are ordered by express, C. O. D., a remittance to cover packing and express charges both ways must accompany the order, and express charges for collection will be added to the amount of the bill. Collection charges will be saved and goods delivered quicker *by remitting in full with order.*

ACCOUNTS

If you have never had an account with us and wish to order goods, send a remittance with order, or first-class references, to insure prompt attention. Failure to remit or send references compels us to make inquiry as to the responsibility of the party ordering, and delays the shipment of goods until we receive satisfactory information.

GUARANTEE

We guarantee our goods to be exactly as represented, and any article which does not prove entirely satisfactory may be returned to us and will be promptly replaced or money refunded.

Our policy has always been to please our patrons in every respect, believing that a thoroughly satisfied customer is the best advertisement.

Should any cause for complaint arise, prompt notice of same would be greatly appreciated.

ALL PRICES SUBJECT TO CHANGE WITHOUT NOTICE.

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DRAWING PAPERS IN SHEETS

WHATMAN'S HAND MADE

The **Whatman's** Papers are made with three different styles of surface, as follows:

H. P. signifies **"Hot Pressed,"** has a smooth surface, mostly used for pencil and ink and very fine line drawing.

C. P. signifies **"Cold Pressed,"** has a finely grained surface; used for general drawing and water-color painting.

R. signifies **"Rough,"** has a coarsely grained surface, used for very bold drawing and sketching (Torchon Paper).

In ordering please state size and surface wanted—H. P., C. P. or R.

No. 1. **"WHATMAN'S"** Drawing Paper. With **H. P.** or **C. P.** surface.

Cap	13 × 17 inches,	Per quire,	$0 60
Demy	15 × 20 "	"	90
Medium	17 × 22 "	"	1 25
Royal	19 × 24 "	"	1 55
Super Royal	19 × 27 "	"	1 85
Imperial	22 × 30 "	"	2 60
Double Elephant	27 × 40 "	"	4 80
Antiquarian	31 × 53 "	"	14 75
"	31 × 53 "	Per sheet,	80

No. 2. **"WHATMAN'S"** Drawing Paper. With **R.** surface (Torchon Paper).

Royal	19 × 24 inches,	Per quire,	$1 55
Imperial	22 × 30 "	"	2 70
Double Elephant	27 × 40 "	"	4 80

No. 3. **"WHATMAN'S"** Drawing Paper. Extra heavy, with **H. P., C. P.** or **R.** surface.

		Per quire.	Per sheet.
Imperial	22 × 30 inches,	$ 6 70	$0 35
Double Elephant	27 × 40 "	10 00	60

For mounted Whatman's Papers see Nos. 125-126.

Samples of Sheet Papers mailed on application, or general Sample Book for 15 cents.

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DRAWING PAPERS IN SHEETS *Continued*

Our different brands of Sheet Papers have been chosen after a careful and exhaustive study, covering our many years of experience, of the requirements of such papers, and our stock as listed fully covers all the demands of the most exacting draftsmen.

These papers are made from selected raw material, in modern equipped mills, and are manufactured exclusively for us.

Each and every sheet is stamped with the brand name and our name.

The facsimile illustrated above is the style of brand stamp used on all our sheet papers, and is a guarantee that the paper is exactly as represented under the brand description.

Our patrons are thus fully protected from the many imitations of our papers.

No. 4. **"HYPERION"** Drawing Paper. For description, see No. 83.

Royal . . .	19 × 24 inches, ...	Per quire, $2 00
Imperial . .	22 × 30 "	" 3 25
Double Elephant	27 × 40 "	" 6 00

No. 5. **"NAPOLEON COLD PRESSED"** Drawing Paper. A hard, smooth, pure white paper of uniform surface, especially adapted for map work and all complicated drawings. Of great strength and durability. Perfect erasing qualities. Will not discolor. An exceptional paper for the highest class of Mechanical Drawing.

Royal . . .	19 × 24 inches, ...	Per quire, $1 65
Imperial . .	22 × 30 "	" 2 35
Double Elephant	27 × 40 "	" 3 60

No. 6. **"SUPER SUPER EGGSHELL"** Drawing Paper. For description, see No. 75.

Royal . . .	19 × 24 inches, rough surface, .	Per quire, $1 80
Imperial . .	22 × 30 " " " .	" 2 75
Double Elephant	27 × 40 " " " .	" 5 25

No. 7. **"LINCOLN"** Drawing Paper. Slightly grained surface. Principally used for architectural drawings.

Royal . . .	19 × 24 inches, ...	Per quire, $1 20
Imperial . .	22 × 30 "	" 1 80
Double Elephant	27 × 40 "	" 3 00

Samples of Sheet Papers mailed on application, or general Sample Book for 15 cents.

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DRAWING PAPERS IN SHEETS *Continued*

No. 8. **"LESSING"** Drawing Paper. Smooth surface for line work in ink or pencil, very tough. Much used for Mechanical and Civil Engineers' drawings and Surveyors' maps.

Double Elephant	27 × 40 inches,	Per quire, $4 50

No. 9. **"STANDARD"** Drawing Paper. A pure white paper of exceptional quality. Largely used by Mechanical and Architectural draftsmen. **For School and College use it is unequalled.** Strong, with uniform surface and excellent erasing properties. A perfect pencil paper, and suitable for ink and color work.

The thickness is in proportion to the size of the sheet; the smallest size being the thinnest.

Cap	14 × 17 inches,	Per quire,	$0 33
Demy	15 × 20 "	"	50
Medium	17 × 22 "	"	66
Royal	19 × 24 "	"	84
Super Royal	19 × 27 "	"	1 00
Imperial	22 × 30 "	"	1 30
Double Elephant	27 × 40 "	"	2 50

No. 10. **"UNION"** Drawing Paper. Very suitable for school use. Slightly grained surface.

Cap	14 × 17 inches,	Per quire,	$0 18
Demy	15 × 20 "	"	24
Medium	17 × 22 "	"	36
Royal	19 × 24 "	"	45
Super Royal	19 × 27 "	"	54
Imperial	22 × 30 "	"	75
Double Elephant	27 × 40 "	"	1 50

No. 11. **"SAXON"** Drawing Paper. For description, see No. 59.

Royal	19 × 24 inches,	Per quire,	$0 90
Imperial	22 × 30 "	"	1 30
Special	24 × 36 "	"	1 90
Double Elephant	27 × 40 "	"	2 00

No. 12. **"CREAM"** Drawing Paper. For description, see No. 60.

Royal	19 × 24 inches,	Per quire,	$1 10
Imperial	22 × 30 "	"	1 60
Special	24 × 36 "	"	2 40
Double Elephant	27 × 40 "	"	2 60

Samples of Sheet Papers mailed on application, or general Sample Book for 15 cents.

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DRAWING PAPERS IN SHEETS *Continued*

No. 13. **"STRATHMORE"** Drawing Paper. Medium surface. For pen and ink sketching and water-color work. Of excellent erasing properties.
14½ × 23 inches, . . Per 100 sheets, $3 00; Per quire, $0 90
23 × 29 " . . " 6 00; " 1 80

No. 14. **"STRATHMORE" 2-Sheet** Drawing Board. Medium surface. For pencil, pen and water-color drawing.
14½ × 23 inches, . . Per 100 sheets, $ 6 00; Per quire, $1 80
23 × 29 " . . " 12 00; " 3 60

No. 15. **"STRATHMORE" 2-Sheet** Drawing Board. Smooth surface. For pen and ink drawing.
14½ × 23 inches, . . Per 100 sheets, $ 6 00; Per quire, $1 80
23 × 29 " . . " 12 00; " 3 60

No. 16. **"STRATHMORE" 3-Sheet** Drawing Board. Medium surface. For pencil, pen and water-color drawing.
14½ × 23 inches, . . Per 100 sheets, $ 9 00; Per quire, $2 70
23 × 29 " . . " 18 00; " 5 40

No. 16B. **"STRATHMORE" 3-Sheet** Drawing Board. Smooth surface. For pen and ink drawing.
14½ × 23 inches, . . Per 100 sheets, $ 9 00; Per quire, $2 70
23 × 29 " . . . " 18 00; " 5 40

No. 16C. **"STRATHMORE"** Illustrating Board. Medium. Water-color paper mounted on heavy board.
22 × 28 inches, ... Per sheet, $0 30
30 × 40 " . . . . . " 50

No. 16D. **"STRATHMORE"** Illustrating Board. Light weight (one side only)
22 × 30 inches, ... Per sheet, $0 20

For Nos. 17 and 18 Blue Print Papers, see page 26.

No. 19. **CHARCOAL PAPER.** White.
Royal 19 × 25 inches, ... Per quire, $0 60

No. 19B. **MICHALLET CHARCOAL PAPER.** White.
Royal 19 × 25 inches, ... Per quire, $0 90

Samples of Sheet Papers mailed on application, or general Sample Book for 15 cents.

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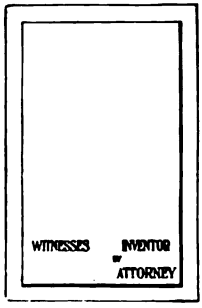
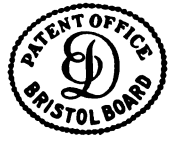
E. D. CO.'S BRISTOL BOARDS



No. 21.

Each Sheet Stamped



This Bristol Board possesses the thickness, quality, tint and size required by the United States Patent Office.

It can be rolled without injury and has a hard, white surface, that stands erasing perfectly.

No. 20. **PATENT OFFICE** Bristol Board. 3-ply. Plain.

	Per gross.	Per doz.
10 × 15 inches, U. S standard, ...	$ 6 00	$0 60
15 × 20 " English standard, ...	12 00	1 20

No. 21. **PATENT OFFICE** Bristol Board. 3-ply. Printed with border, etc.

	Per gross.	Per doz.
10 × 15 inches, U. S. standard, ...	$6 90	$0 72

No. 24. **"IVORY WHITE"** Bristol Board. 3-ply. For pen and ink drawings.

20 × 30 inches, ... Per doz.,	$1 80
30 × 40 " . . . . . "	3 60

No. 26. **REYNOLDS'** White Bristol Board. Smooth surface.

			2 sheets.	3 sheets.	4 sheets.
Cap	12½ × 15½ inches.	Per doz.,	$0 60	$0 90	$1 20
Demy	14⅝ × 18½ "	"	90	1 35	1 75
Medium	16½ × 20¾ "	"	1 20	1 80	2 40
Royal	18½ × 22⅝ "	"	1 50	2 40	3 10
Imperial	21½ × 28¾ "	"	...	4 70	6 00

No. 27. **REYNOLDS'** White Bristol Board, printed with border, etc., for U. S. Patent Office drawings, 10 x 15 inches, 3-ply, . . . Per doz., $1 05

No. 30. **WHITE** Mounting Board.

	22 × 28 4 ply.	22 × 28 6 ply.	22 × 28 8 ply.	28 × 44 10 ply	30 × 40 in. 16 ply.
Per doz.,	$0 75	$1 00	$1 20	$3 00	$5 25
Per sheet,	08	10	12	30	50

For Printing Frames for Patent Office Drawings, see Nos. 252A and 252B.

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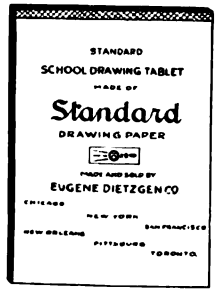
"STANDARD" SCHOOL DRAWING TABLET



No. 32.

No. 32. **"STANDARD"** School Drawing Tablet. Made of No. 9 "Standard" drawing paper, 9 x 12 inches, 16 sheets, heavy manilla envelope with each tablet, ... Per doz., $3 00

SOLID SKETCH BLOCKS—PLAIN.

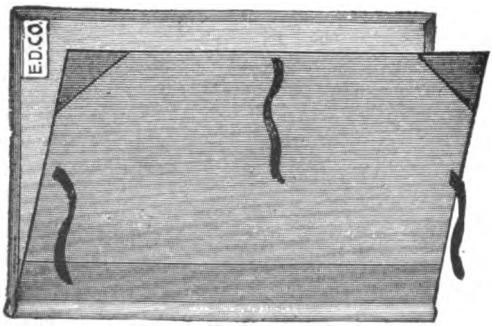
	Sizes,	5x7	7x10	9x12	10x14	14x20 in.
No. 34.	Standard Paper, Per doz.,	$2 40	$4 20	$ 5 60	$ 7 00	$12 20
35.	Whatman's " "	5 00	9 00	12 50	17 40	31 50

SOLID SKETCH BLOCKS—BOUND.

Leather Back and Corners, Cloth Sides, Pencil Loop.

	Sizes,	5x7	7x10	9x12	10x14	14x20 in.
No. 36.	Standard Paper, Per doz.,	$ 8 00	$11 00	$14 25	$16 50	$28 00
37	Whatman's " "	10 00	15 90	21 50	26 00	46 75

PORTFOLIOS



No. 38.

No. 38. Paper Sides, Cloth Back and Corners.

	Sizes,	12x16	14x18	17x22	20x26	23x31 in.
	Per doz., ...	$6 30	$7 80	$10 50	$14 40	$19 20

39. Cloth Sides, Leather Back and Corners.

	Sizes,	12x16	14x18	17x22	20x26	23x31 in.
	Per doz., ...	$13 00	$14 50	$18 00	$24 00	$33 00

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DETAIL PAPERS IN ROLLS

No. 50. **"ORION"** Manilla Paper. Smooth. Is mostly used by Pattern Makers; it will not stand much erasing. Three weights: Medium (X), thick (XX), and extra thick (XXX).
In rolls of about 75-100 lbs., 36, 40, 44, 48 in. wide. Per pound, $0 10

"LIGHT COLOR ORION" Detail Paper. Of selected manilla stock, expressly made for drafting purposes.

Nos. 52A, 52B, 52C are made with slightly ribbed (R) surface.

Nos. 53A, 53B, 53C are made with slightly grained (G) surface.

They stand a reasonable amount of erasing and will take India ink and pencil well.

No. 52A. With "R" surface. } **Medium.**	In rolls of about 100-120 lbs.,				
No. 53A. With "G" surface. }	36, 42, 48 in. wide, Per pound,				$0 11
36 inches wide, . . .	Per 100 yds.,	$3 60;	50 yds.,		2 00
42 " " . . .	"	4 00;	"		2 25
48 " " . . .	"	4 50;	"		2 50

No. 52B. With "R" surface. } **Thick.**	In rolls of about 100-120 lbs.,				
No. 53B. With "G" surface. }	36, 42, 48 in. wide, . Per pound,				$0 11
36 inches wide, . . .	Per 100 yds.,	$4 20;	50 yds.,		2 30
42 " " . . .	"	4 80;	"		2 70
48 " " . . .	"	5 50;	"		3 10

No. 52C. With "R" surface. } **Extra Thick.**	In rolls of about 100-120 lbs.,				
No. 53C. With "G" surface. }	36, 42, 48 in. wide, Per pound,				$0 11
36 inches wide, . . .	Per 100 yds.,	$4 80;	50 yds.,		2 70
42 " " . . .	"	5 50;	"		3 10
48 " " . . .	"	6 25;	"		3 50

No. 54A. **"BUFF COLOR ORION"** Detail Paper. **Medium.** Slightly grained surface. The best manilla drafting paper; stands erasing to a very fair extent, and takes pencil and ink well. Its tint permits of much handling without soiling.

In rolls of about 100-120 lbs., 36, 42, 48 in. wide, . Per pound,					$0 12
36 inches wide, . . .	Per 100 yds.,	$4 50;	50 yds.,		2 50
42 " " . . .	"	5 40;	"		3 10
48 " " . . .	"	6 00;	"		3 40

No. 54B. **"BUFF COLOR ORION"** Detail Paper. **Thick.**

In rolls of about 100-120 lbs., 36, 42, 48, 54 in. wide, Per pound,					$0 12
36 inches wide, . . .	Per 100 yds.,	$5 10;	50 yds.,		2 90
42 " " . . .	"	6 00;	"		3 40
48 " " . . .	"	7 20;	"		4 00
54 " " . . .	"	8 10;	"		4 50

No. 54C. **"BUFF COLOR ORION"** Detail Paper. **Extra Thick.**

In rolls of about 100-120 lbs., 36, 42, 48 in. wide, . Per pound,					$0 12
36 inches wide, . . .	Per 100 yds.,	$5 70;	50 yds.,		3 20
42 " " . . .	"	6 90;	"		3 80
48 " " . . .	"	8 10;	"		4 50

Samples of Roll Papers mailed on application, or general Sample Book for 15 cents.

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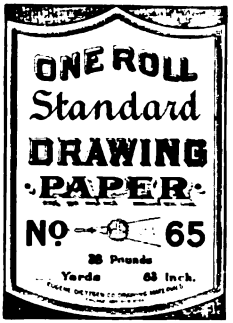
DRAWING PAPERS IN ROLLS



(Reduced facsimiles of our labels.)

In determining the Roll Drawing Papers to be catalogued, we have kept in view the fact that no two papers listed should combine the same features; but that each paper in the assortment should possess certain special characteristics, so that the draftsman can select from the line represented a paper suitable for his particular uses.

Careful attention is given to maintaining uniformity in the thickness and surface of our papers.

This feature is of great importance, and has been attained by having the papers manufactured solely for us, in modern equipped mills, and of selected raw material.

All roll papers are water-marked along the edge with our initials, and the brand name of the paper, thus "E. D. Co" "Teuton," etc. Papers so water-marked can be obtained only from us or from dealers handling our goods.

Any paper thus marked is guaranteed by us to be of the highest quality in its respective brand, and exactly as represented under the catalogue description.

After each paper listed will be found a brief explanation of its various properties, thus enabling anyone not familiar with our goods to choose a paper best adapted for their purpose.

In addition to the general line of Drawing Papers listed, our higher grade unprepared Blue Print Papers will be found very suitable for drawing purposes; they are strong, of uniform surface and good erasing qualities.

Sample Books of our Sheet, Roll, Mounted, Unprepared Blue Print, or Tracing Papers sent on application.

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DRAWING PAPERS IN ROLLS *Continued*

No. 55. **"TREVES"** Drawing Paper. **Thick.** A low-priced white paper, suitable for preliminary work. Strong, with good erasing properties. Slightly grained surface. Will take ink and color.

In rolls of about 40 lbs., 30, 36, 42 inches wide, Per pound, $0 20

	Per 100 yds.	50 yds.	25 yds.	10 yds.
30 inches wide, . .	$6 80	$3 75	$2 10	$0 95
36 " " . .	8 00	4 40	2 45	1 10
42 " " . .	9 40	5 20	2 85	1 30

No. 56. **"TEUTON"** Drawing Paper. **Medium.** An extremely tough, white sketching paper, with smooth surface. Will not break in folding. With best erasing qualities, and suitable for pencil, ink and color work. Very moderate in price.

In rolls of about 100 lbs., 36 or 42 inches wide, Per pound, $0 24

	Per 100 yds.	50 yds.	25 yds.	10 yds.
36 inches wide, . .	$5 75	$3 25	$1 80	$0 80
42 " " . .	6 70	3 75	2 20	1 00

No. 58. **"TEUTON"** Drawing Paper. **Thick.** Similar to No. 56, but of considerably heavier stock.

In rolls of about 100 lbs., 36 or 42 inches wide, Per pound, $0 24

	Per 100 yds.	50 yds.	25 yds.	10 yds.
36 inches wide, . .	$8 70	$4 90	$2 80	$1 30
42 " " .	10 20	5 60	3 25	1 50

No. 59B. **"WENONAH"** Drawing Paper. (Not water-marked). An excellent high grade buff color paper, with slightly grained surface. Strong, durable and of good erasing properties. Will stand rough handling.

In rolls of about 40–45 lbs., 30, 36, 42 inches wide, Per pound, $0 20

	Per 100 yds.	50 yds.	25 yds.
30 inches wide, . .	$5 50	$3 00	$1 65
36 " " . .	6 50	3 50	1 95
42 " " . .	8 00	4 25	2 35

No. 59. **"SAXON"** Drawing Paper. Of light cream color and smooth, hard surface. Takes ink, pencil and water-color. Does not become brittle, and stands erasing to the greatest extent.

In rolls of about 40–45 lbs., 30, 36, 42 inches wide, Per pound, $0 25

	Per 100 yds.	50 yds.	25 yds.
30 inches wide, . .	$ 7 50	$4 00	$2 15
36 " " . .	9 00	4 80	2 60
42 " " . .	11 30	6 00	3 20

Samples of Roll Papers mailed on application, or general Sample Book for 15 cents.

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DRAWING PAPERS IN ROLLS *Continued*

No. 60. **"CREAM"** Drawing Paper. Is the finest paper in the market for preliminary and general drawings and sketching, and the **cheapest** that meets all requirements of a good drawing paper. It will stand erasing perfectly, and take ink, pencil and water-color well. Unlike other papers of similar kind, it will not break in folding. Its cream tint is agreeable to the eye, and will admit of much handling without soiling.

In rolls of about 35–40 lbs., 27, 30, 36, 42, 63 in. wide, Per pound, $0 29

	Per 100 yds.	50 yds.	25 yds.	10 yds.	Yard.
27 inches wide, . .	$ 9 00	$ 4 60	$2 40	$1 00	$0 12
30 " " . .	9 70	5 10	2 70	1 15	13
36 " " . .	11 00	5 75	3 10	1 35	15
42 " " . .	14 25	7 50	4 00	1 70	20
63 " " . .	19 50	10 25	5 35	2 50	30

No. 62. **"SILVER GRAY"** Drawing Paper. Has a pleasing tint that shows up effectively drawings and sketches. Its first-class erasing quality, combined with its reasonable price, has made it a very popular paper for general drawings. Of the same superior stock as No. 60.

In rolls of about 35–40 lbs., 27, 36, 63 inches wide, . Per pound, $0 33

	Per 100 yds.	50 yds.	25 yds.	10 yds.	Yard.
27 inches wide, . .	$ 9 60	$ 5 10	$2 70	$1 14	$0 12
36 " " . .	12 00	6 30	3 30	1 35	15
63 " " . .	21 00	10 80	5 70	2 40	30

No. 65. **"STANDARD"** Drawing Paper. A pure white paper of exceptional quality. Uniform in thickness and surface. Strong, with excellent erasing properties. Suitable for ink, pencil or color work.

In rolls of about 35–40 lbs., 27, 36, 42, 63 in. wide, Per pound, $0 36

	Per 50 yds.	25 yds.	10 yds.	Yard.
27 inches wide, . .	$ 6 30	$3 30	$1 35	$0 15
36 " " . .	7 20	3 90	1 65	20
42 " " . .	9 00	4 80	2 10	24
63 " " . .	12 60	6 90	3 00	35

No. 70. **"DOUBLE FORCE"** Drawing Paper. Is the toughest paper made. Its surface is cold pressed, but somewhat smooth. Can be folded without breaking, and is very suitable for map work or drawings subjected to rough handling in the machine shop or outdoors.

In rolls of about 45 lbs., 27, 36, 42, 63, 72 in. wide, Per pound, $0 45

	Per 25 yds.	10 yds.	Yard.
27 inches wide, ...	$ 4 00	$1 68	$0 19
36 " "	5 00	2 10	25
42 " "	6 50	2 65	30
63 " "	9 50	3 90	45
72 " "	11 75	4 95	55

Samples of Roll Papers mailed on application, or general Sample Book for 15 cents.

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DRAWING PAPERS IN ROLLS *Continued*

No. 75. **"SUPER SUPER EGGSHELL"** Drawing Paper. Is made of the **best** linen stock. Owing to its peculiarly pebbled surface, drawings made on it show up most effectively. Unsurpassed for perspective drawing and water-color work.

In rolls of about 45 lbs., 36, 42 inches wide, . Per pound, $0 50
" " " " 60 " 58 " " . . " " 50

	Per 25 yds.	10 yds.	Yard.
36 inches wide, ...	$ 7 20	$3 00	$0 33
42 " "	8 40	3 50	36
58 " "	10 80	4 50	47

No. 76. **"SUPER SUPER EGGSHELL"** Drawing Paper. **Extra Heavy.**
In rolls of about 60 lbs., 58 inches wide, . . Per pound, $0 50

	Per 25 yds.	10 yds.	Yard.
58 inches wide, ...	$13 50	$5 70	$0 65

No. 80. **"SUPER SUPER COLD PRESSED"** Drawing Paper. Is made of the same stock as Nos. 75-76, and differs from them only in the surface, which is cold pressed, or medium smooth.

In rolls of about 45 lbs., 36, 42 inches wide, . Per pound, $0 50
" " " " 60 " 58 " " . . " " 50

	Per 25 yds.	10 yds.	Yard.
36 inches wide, ...	$ 7 20	$3 00	$0 33
42 " "	8 40	3 50	36
58 " "	10 80	4 50	47

No. 81. **"SUPER SUPER COLD PRESSED"** Drawing Paper. **Extra Heavy.**
In rolls of about 60 to 70 lbs., 58 inches wide, . . Per pound, $0 50

	Per 25 yds.	10 yds.	Yard.
58 inches wide, ...	$13 50	$5 70	$0 65

No. 83. **"HYPERION"** Drawing Paper. **Extra Heavy.** A combination paper, embodying the advantages of a hand and machine-made paper. Made of the highest grade selected stock, of pure white color, with smooth, uniform and firm surface. **Undoubtedly the best paper manufactured.** Of excellent erasing quality, equally well adapted for pencil, ink or color. A perfect paper for photographic and engrossing work. The same paper in sheets listed under No. 4.

In rolls of about 40 lbs., 59 inches wide, . . . Per pound, $0 65

	Per 25 yds.	10 yds.	Yard.
59 inches wide, ...	$14 20	$6 00	$0 70

Samples of Roll Papers mailed on application, or general Sample Book for 15 cents.

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MOUNTED DRAWING PAPERS

MOUNTED ON MUSLIN

(Reduced facsimiles of our labels.)

On account of the increased demand for Mounted Papers to be used for Recorders' plats, County and State maps, and all drawings which are of permanent value, we have greatly enlarged our facilities for this line of work.

Our Mounting Departments are large, modern and thoroughly equipped, and only the most expert mounters are employed.

The unsatisfactory compression process of mounting has long been discarded by us. Papers thus mounted are compressed between rollers and dried by heat. Mounting by this method can be done more rapidly and at less cost to the manufacturer, but the results are far from permanent, while the paper is strained and the surface injured.

All our papers are mounted stretched, and air-dried.

By this process the muslin and paper become inseparable, the paper adhering at **the edges** equally as well as in the center. Both the surface and strength of the paper remain the same as in the unmounted stock.

No. 99. **"CREAM"** Drawing Paper. Mounted. The same paper as described under No. 60.

	Per 10 yds.	Yard.
36 inches wide,	$ 5 80	$0 70
42 " "	7 50	90
63 " "	12 00	1 40

No. 100. **"SILVER GRAY"** Drawing Paper. Mounted. The same paper as described under No. 62.

	Per 10 yds.	Yard.
36 inches wide,	$ 6 20	$0 75
63 " "	13 00	1 50

No. 101. **"STANDARD"** Drawing Paper. Mounted. The same paper as described under No. 65.

	Per 10 yds.	Yard.
36 inches wide,	$ 6 20	$0 75
42 " "	7 75	90
63 " "	13 00	1 50

No. 105. **"DOUBLE FORCE"** Drawing Paper. Mounted. The same paper as described under No. 70.

	Per 10 yds.	Yard.
36 inches wide,	$ 6 60	$0 80
42 " "	8 40	1 00
63 " "	13 50	60
72 " "	16 75	2 00

Samples of Mounted Papers mailed on application, or general Sample Book for 15 cents.

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MOUNTED DRAWING PAPERS IN ROLLS *Continued*

No. 110. **"SUPER SUPER EGGSHELL"** Drawing Paper. Mounted. The same paper as described under No. 75.

	Per 10 yds.	Yard.
36 inches wide,	$ 7 50	$0 90
42 " "	9 25	1 10
58 " "	12 50	1 45

No. 111. **"SUPER SUPER EGGSHELL"** Drawing Paper. Mounted. Extra heavy. The same paper as described under No. 76.

	Per 10 yds.	Yard.
58 inches wide,	$13 70	$1 60

No. 115. **"SUPER SUPER COLD PRESSED"** Drawing Paper. Mounted. The same paper as described under No. 80.

	Per 10 yds.	Yard.
36 inches wide,	$ 7 50	$0 90
42 " "	9 25	1 10
58 " "	12 50	1 45

No. 116. **"SUPER SUPER COLD PRESSED"** Drawing Paper. Mounted. Extra heavy. The same paper as described under No. 81.

	Per 10 yds.	Yard.
58 inches wide,	$13 70	$1 60

No. 117. **"HYPERION"** Drawing Paper. Mounted. The same paper as described under No. 83.

	Per 10 yds.	Yard.
59 inches wide,	$14 50	$1 75

No. 120. **INDESTRUCTIBLE PAPER CLOTH.** Smooth. An article made of muslin, to which the paper pulp is applied. It is pliable and very strong, takes pencil and ink well and stands erasing to a serviceable extent. In rolls of 30–40 yards.
38 inches wide, ... Per yard, $0 42

MOUNTED DRAWING PAPERS IN SHEETS

Furnished either with the muslin standing over on one or all edges, or with edges trimmed to the exact size of the sheet. Unless otherwise specified the sheets will be furnished with muslin trimmed on all edges.

Large sheets, for City, County or State maps, mounted to order on short notice.

No. 125. **"WHATMAN'S"** Drawing Paper, Mounted. (Specify whether hot or cold pressed surface.)
Imperial . . 22 × 30 inches, ... Per sheet, $0 48
Double Elephant 27 × 40 " . . . . " 90

No. 126. **"WHATMAN'S"** Drawing Paper. Double Mounted. (Specify whether hot or cold pressed surface.) For Map or Atlas work. Double mounted—muslin in the middle, with paper on both sides.
Imperial . . 22 × 30 inches, ... Per sheet, $0 86
Double Elephant 27 × 40 " . . . . " 1 50

No. 127. **"SUPER SUPER EGGSHELL."** Drawing Paper, No. 75, Mounted. Or if desired S. S. Cold Pressed, No. 80, mounted; please specify.
22 × 30 inches, ... Per sheet, $0 45
27 × 40 " . . . . . " 75

No. 128. **"SUPER SUPER EGGSHELL"** Drawing Paper, No. 75, Double Mounted. For Atlas work. Or if desired S. S. Cold Pressed, No. 80, double mounted; please specify.
22 × 30 inches, ... Per sheet, $0 90
27 × 40 " . . . . . " 1 45

Other sizes of mounted sheets furnished to order.

Samples of Mounted Papers mailed on application, or general Sample Book for 15 cents.

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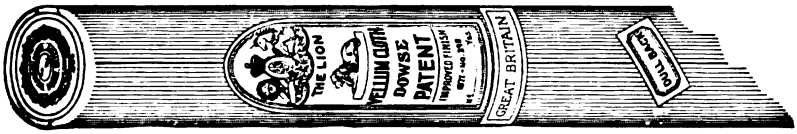
TRACING CLOTHS

"LION" TRACING CLOTH.

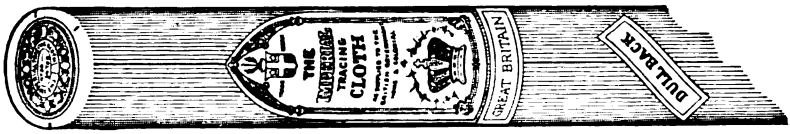


No. 133.

No. 133. **"LION"** Tracing Cloth, rolls of 24 yards, one side glazed, the other dull.

30 inches wide, ...	Per roll,	$ 6 40;	Per yard,	$0 35
36 " "	"	7 40;	"	40
42 " "	"	10 00;	"	50

"IMPERIAL" TRACING CLOTH.



No. 135.

No. 135. **"IMPERIAL"** Tracing Cloth, rolls of 24 yards, one side glazed, the other dull.

30 inches wide, ...	Per roll,	$ 8 10;	Per yard,	$0 40
36 " "	"	9 00;	"	45
38 " "	"	11 10;	"	55
42 " "	"	12 10;	"	60
48 " "	"	16 00;	"	80
54 " "	"	17 00;	"	85

"RELIANCE" TRACING CLOTH.

No. 136.

No. 136. **"RELIANCE"** Tracing Cloth, rolls of 24 yards, one side glazed, the other dull.

30 inches wide, ...	Per roll,	$ 6 40;	Per yard,	$0 35
36 " "	"	7 40;	"	40
43 " "	"	10 00;	"	50

The Reliance Cloth is heavier and less transparent than Nos. 133 and 135.

Samples of Tracing Cloth and Papers mailed on application, or general Sample Book for 15 cents.

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TRACING CLOTH PREPARATIONS

LIQUID TRACING CLOTH CLEANER.

No. 140.

No. 140. This liquid is excellent for removing pencil marks, dirt and grease spots from tracings. It has no affect on waterproof ink, and does not injure the surface for inking. The piece of flannel, furnished with each bottle, is moistened and gently rubbed over the surface to be cleaned.
In 2 oz. bottles, ... Each, $0 35

TRACING CLOTH POWDER.

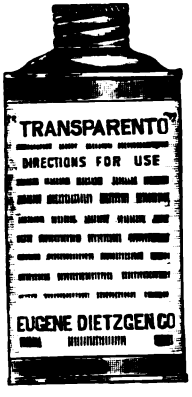
No. 142.

No. 142. **Tracing Cloth Powder.** Rubbed evenly with a piece of flannel over the cloth and then removed, in order to make the cloth take ink readily.
In tin shakers, Each, $0 15

INKOFF.

No. 144. **Inkoff.** For erasing Black Waterproof Drawing Ink lines and figures without injury to the tracing cloth.
In 1 oz. bottles, with blotters, cloths and directions for use, ... Each, $0 45

TRANSPARENTO



No. 146.

No. 146. **Transparento.** For transparentizing Drawings and Tracings. Especially valuable for use on Drawings made on bristol board or heavy white drawing paper, Vandyke negatives on cloth or paper, old or soiled drawings or tracings of any kind. Will affect neither ink nor pencil marks, nor cause paper or cloth to become brittle. Transparento is not inflammable.

In cans,	4 oz.	½ Pt.	Pt.	Qt.
Each,	$0 50	1 00	1 50	2 50

Directions for using furnished with each can.

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TRACING PAPERS IN ROLLS

(Reduced facsimiles of our labels.)

Careful attention has been given to our selection of Tracing Papers, and we feel confident that our very complete assortment will be found to meet all requirements.

While each Paper listed is followed by a brief explanation of its various properties, it is somewhat difficult to explain clearly and concisely the exact differences of the various papers, and we suggest that whenever possible the selection be made from our sample book. The following classification, however, will further aid our patrons in determining the papers best suited to their purposes, when it is necessary to depend entirely upon the catalogue description.

Nos. 170, 170B, 171, 172, 174, 175, 176, 181, 182, 186 and 189 are transparent, inexpensive and of moderate strength; they are recommended for general tracing work where great strength of paper is not required.

Nos. 177, 177C, 177½, 178, 179, 180 and 180B are strong, durable white papers, especially adapted for tracings subjected to considerable handling; their transparency is in proportion to the thickness.

Nos. 183, 184, 185, 185A, 185B, 185C and 188 are made of superior bond stock, which, by special treatment, is rendered very transparent; they are excellent for tracing indistinct drawings and for all tracings that are to be reproduced by any solar printing process.

In addition to the Tracing Papers listed, our high grade thin unprepared Blue Print Papers will be found very suitable for tracing purposes.

No. 170. **"ORION"** Detail Tracing Paper. Manilla stock. Glazed.
Very transparent.

40 inches wide, ...	Per roll of 100 yds.,	$2 40
48 " "	" " " 100 "	3 00

No. 170B. **"ORION"** Detail Tracing Paper. Manilla stock. Unglazed.
Strong. Of moderate transparency

40 inches wide, ...	Per roll of 100 yds.,	$2 40
48 " "	" " " 100 "	3 00

Samples of Tracing Cloth and Papers mailed on application, or general Sample Book for 15 cents.

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TRACING PAPERS IN ROLLS *Continued*

No. 171. **"ULTRA"** Detail Tracing Paper. White in color and superior to Manilla Tracing Papers. Recommends itself on account of its low price for common full-size tracings.
40 inches wide, ... Per roll of 50 yds., $1 50
48 " " . . . . . " " " 50 " 1 80

No. 172. **"ZETA"** Tracing Paper. Thin. Glazed. Very transparent. Ordinarily called "Glass Paper," used mostly for lithographic work.
39 inches wide, ... Per roll of 20 yds., $1 35

No. 174. **"TRIUMPH"** Tracing Paper. Medium thick. Transparent. Takes pencil and ink well.
39 inches wide, ... Per roll of 20 yds., $1 20

No. 175. **"ADVANCE"** Tracing Paper. Thin. Very transparent.
42 inches wide, ... Per roll of 20 yds., $1 20

No 176. **"AZURE"** Tracing Paper. Thin. Strong. Transparent. Bluish in color.
39 inches wide, ... Per roll of 20 yds., $1 20

No. 177. **"BOND"** Tracing Paper. Thin. Dull finish. Very tough and transparent.
42 inches wide, ... Per roll of 20 yds., $1 35

No. 177C. **"COBWEB BOND"** Tracing Paper. An excellent thin, white tracing paper. Stands considerable erasing. Strong and transparent.
36 inches wide, . . Per roll of 25 yds., $1 60; 50 yds., $3 00
42 " " . . " " " 25 " 1 75; 50 " 3 25

No. 177½. **"CENTURY BOND"** Sketching Paper. Medium thick. Of unsurpassed strength and moderate transparency. Especially adapted for machine drawings and other work requiring considerable handling.
36 inches wide, . . Per roll of 25 yds., $1 85; 50 yds., $3 50
42 " " . . " " " 25 " 2 20; 50 " 4 00

No. 178. **"FEDERAL"** Tracing Paper. Unglazed. The best for detail or full size tracings.
57 inches wide, ... Per roll of 44 yds., $3 90

No. 179. **"FEDERAL"** Tracing Paper. Glazed.
57 inches wide, ... Per roll of 44 yds., $3 90

No. 180. **"NATURAL"** Tracing and Sketching Paper. Medium thick. A white paper, strong and tough, especially made for sketching and transferring. Stands erasing, and takes pencil, ink and color well.
36 inches wide, ... Per roll of 50 yds., $2 40
62 " " . . . . . " " " 50 " 3 60

No. 180B. **"NATURAL"** Tracing and Sketching Paper. Thin. Like No. 180, but considerably thinner, and of greater transparency.
36 inches wide, ... Per roll of 50 yds., $2 15
62 " " . . . . . " " " 50 " 3 00

Samples of Tracing Cloth and Papers mailed on application, or general Sample Book for 15 cents.

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TRACING PAPERS IN ROLLS *Continued*

No. 181. **"VIENNA"** Tracing Paper. Medium thick.
43 inches wide, ... Per roll of 20 yds., $2 00

No. 182. **"VIENNA"** Tracing Paper. Thick.
43 inches wide, ... Per roll of 20 yds., $2 40

No. 183. **"PARCHMENT"** Tracing Paper. Medium thick.
39 inches wide, ... Per roll of 20 yds., $3 50

No. 184. **"PARCHMENT"** Tracing Paper. Thick.
39 inches wide, ... Per roll of 20 yds., $4 20

No. 185. **"VELLUM"** Tracing Paper. Medium thick. Bluish in color. Very strong and transparent, and will take ink and colors without shrinking. Recommended for tracings that are to be reproduced by any solar printing process. An excellent substitute for tracing cloth.
39 inches wide, ... Per roll of 20 yds., $3 20

No. 185A. **"ARGUS"** Tracing Paper. Thick. Strong and transparent. Very fine for ink and color work.
39 inches wide, ... Per roll of 20 yds., $3 60

No. 185B. **"CRESCENT"** Tracing Paper. Medium thick. Strong and transparent.
43 inches wide, ... Per roll of 20 yds., $3 60

No. 185C. **"OXFORD"** Tracing Paper. Thin. Bluish in color. Very transparent.
43 inches wide, ... Per roll of 20 yds., $2 90

No 186. **"PREMIER"** Tracing Paper. Medium thick.
42 inches wide, ... Per roll of 20 yds., $2 00

No. 188. **"STERLING"** Tracing Vellum. Of exceptional strength and transparency. Very fine for ink and color work. Stands erasing perfectly and does not "buckle" nor deteriorate. Incased in strong tubes.
36 inches wide, ... Per roll of 20 yds., $4 00
42 " " . . . . . " " " 20 " 5 00

No. 189. **"DEECO"** Tracing Paper. Thin. Very transparent. Especially adapted for use in tracing from blue prints.
42 inches wide, ... Per roll of 20 yds., $1 75

TRACING PAPERS IN SHEETS

No. 190. **"VEGETABLE"** Tracing Paper. Very tough and transparent.

Cap	13 × 17 inches, ...	Per quire,	$0 90
Demy	16 × 20 "	"	1 25
Royal	19 × 25 "	"	2 00
Imperial	22 × 28 "	"	2 50

No. 198. **"CRANE'S"** Bond Paper.

		Thin No. 16	Medium No. 18	Thick No. 21
19 × 24 inches, . . .	Per quire,	$0 90	$1 10	$1 30
19 × 30 "	"	1 20	1 40	1 60

Samples of Tracing Cloth and Papers mailed on application, or general Sample Book for 15 cents.

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SOLAR AND ELECTRIC PRINTING DEPARTMENTS

At our establishments in **Chicago, New York, San Francisco, New Orleans, Pittsburg** and **Toronto** we operate large departments fully equipped for reproducing tracings and drawings by **sun** or **electric light,** thus enabling Engineers, Architects and the general trade, in any part of the country, who have limited printing facilities, to obtain quickly and at a reasonable price any number of prints desired.

We make a specialty of the following kinds of prints, made on either paper or cloth:

Blue Prints (white lines on blue background).

Vandyke Negatives (white lines on brown background).

Blue Line Prints (blue lines on white background).

Black Line Prints (black lines on white background).

Hektograph Prints.

By using our "Lumine" or "Unaqua" Direct Process Papers, we can make Blue Line or Black Line Prints **direct** from the original tracing, eliminating the use of a Negative.

Upon request, sample prints will be sent and prices quoted on any of the above processes.

Tracings sent to us, with information regarding the kind of prints and number of copies desired, will be promptly reproduced and returned to sender.

PRINTING EQUIPMENT

We have installed in our different houses perfect equipments for printing by electric light; both vertical and continuous Blue Print Machines of modern construction are used, and every improvement that would facilitate printing by this process has been adopted. **We are thus able to make prints rapidly and with perfect results.**

For sun printing, our departments are equipped with our **improved** Vacuum Frames, by which the finest lines of a drawing are reproduced sharply and distinctly.

Special attention is given to map printing and mounting. Large Vacuum Frames, designed to meet all the requirements of map printing, have been installed; and our map work is noted for its sharp, distinct lines, and clear, unclouded backgrounds.

Maps, when desired, are mounted on muslin by our improved mounting process, and permanent, durable results are obtained. All of the joining edges of maps (when maps are in several sections) are accurately beveled, thus insuring strong, smooth, scarcely perceptible seams.

If ordered, maps will be attached to either plain or spring rollers, at lowest prices.

For Tubes for expressing or filing Tracings, Drawings, etc., see Nos. 243-248I.

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BLUE PRINT PAPERS

Our assortment of sensitized Blue Print Papers as listed on the following pages will be found of a variety sufficient to fulfill any requirement.

We pay particular attention to this department of our business, and as we have adopted every improvement in coating methods, which our many years of experience has suggested, we feel justified in saying that our plants for scientifically preparing Blue Print and Vandyke Papers are unequaled.

We use the purest chemicals and employ only such papers which extensive tests have proven best adapted for the purpose. Expense has been entirely disregarded when some device which would improve our products could be adopted. By adhering to this policy, and by making use of improved processes and machinery whenever possible, we have gradually evolved our present splendid equipment. The extraordinary success attained by our product proves conclusively that our efforts in this direction are fully appreciated by our patrons.

"RADIANT" Papers are manufactured for us by the **Johannot Mills,** in France, who have a world-wide reputation for making papers of unsurpassable excellence. They are of the highest grade of chemically pure stock, of unequaled tensile strength, always uniform in weight and have a superior finish. These features, combined with our famous sensitizing solutions, produce a Blue Print Paper, the printing and keeping qualities of which defy comparison. **All these papers bear our brand name and the water-mark of the mill.**

"HYPERION" Papers are of a high grade of chemically pure stock, will always be found uniform in strength and finish, and of first-class printing and keeping qualities. **These papers bear the brand name and our initials.**

"UNION" Papers are of the second grade of stock and are manufactured by us to fill a demand for a low-priced, reliable Paper, for shop use and general distribution. They will be found to equal, if not surpass, many other so-called "high grade" papers.

We manufacture our Blue Print Papers regularly in **four solutions,** as described below, but can also furnish our papers coated with any special solution desired, to meet local conditions as to sun or artificial light.

Regular Printing.—Requiring an exposure of about four minutes in bright sunlight. Best adapted for use during the summer months and for making Blue Line Positive Prints from Vandyke Negatives. Of unsurpassed keeping qualities and will produce prints of a deep, rich color, with sharp lines.

Rapid Printing.—Requiring an exposure of about one minute in bright sunlight. **These Papers were first introduced by us,** are invaluable in cloudy weather, and are now generally used in place of the Regular Solution by those who require prompt results; of first-class printing and keeping qualities.

Extra Rapid Printing.—Requiring an exposure from thirty to forty seconds in bright sunlight. Especially adapted for printing under adverse weather conditions. Can also be used for Electric Light printing.

Electric Rapid Printing.—Requiring an exposure of about twenty to thirty seconds in bright sunlight. On account of the extreme sensitiveness of this solution, it is not recommended for use during the summer months, excepting for printing by **Electric Light**, for which it is especially adapted.

In ordering Blue Print Papers, we request our patrons to please **specify whether "Regular," "Rapid," "Extra Rapid," or "Electric Rapid" Printing Paper is desired,** thus avoiding any unnecessary delays in filling orders.

All our Sensitized Blue Print Papers, are unrivaled in **richness** and **permanency** of color, **sharpness** of lines, **strength** in water bath and for their superior **keeping qualities.**

We have extensive departments for sensitizing our various papers at our houses in **Chicago, New York, San Francisco, New Orleans and Toronto.** With these unparalleled facilities our patrons in any part of the country are assured of receiving only freshly prepared paper at all times.

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"RADIANT" BLUE PRINT PAPERS

DAILY FRESHLY PREPARED *Highest Grade*

(Reduced facsimiles of our labels.)

In ordering, please specify whether our "REGULAR," "RAPID," "EXTRA RAPID" or "ELECTRIC RAPID" PRINTING solution is desired.

No. 207. **"RADIANT SATIN." Medium thick.**

	Width,	30 in.	36 in.	42 in.	54 in.
Per roll of 10 yds., prepared,		$1 45	$1 65	$1 85	$2 50
" 50 " "		5 75	6 85	8 00	10 40

No. 209. **"RADIANT SATIN." Thick.**

	Width,	30 in.	36 in.	42 in.
Per roll of 10 yds., prepared,	. . .	$1 55	$1 75	$2 00
" 50 " "	. . .	6 65	7 75	8 85

No. 211. **"RADIANT PARCHMENT." Extra thin.**

	Width,	30 in.	36 in.	42 in.
Per roll of 10 yds., prepared,	. .	$1 10	$1 40	$1 55
" 50 " "	. . .	4 50	5 50	6 65

No. 212. **"RADIANT PARCHMENT." Thin.**

	Width,	30 in.	36 in.	42 in.	54 in.
Per roll of 10 yds., prepared,		$1 40	$1 55	$1 75	$2 40
" 50 " "		5 50	6 65	7 75	9 90

No. 213. **"RADIANT PARCHMENT." Medium thick.**

	Width,	30 in.	36 in.	42 in.
Per roll of 10 yds., prepared,	. .	$1 50	$1 70	$1 90
" 50 " "	. . .	6 00	7 15	8 25

No. 214. **"RADIANT PARCHMENT." Thick.**

	Width,	30 in.	36 in.	42 in.
Per roll of 10 yds., prepared,	. .	$1 65	$1 90	$2 20
" 50 " "	. . .	7 15	8 25	9 35

"PHOTOGRAPHIC" BLUE PRINT PAPER

No. 199. **"PHOTO"** Blue Print Paper, 25 in. wide, Per roll of 10 yds., $3 00
Especially adapted for glass negative work. Used largely for making prints of Furniture, Machinery, etc., where fine detail is desired.

For description of papers, see preceding page.

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"HYPERION" BLUE PRINT PAPERS AND CLOTH

DAILY FRESHLY PREPARED *High Grade*

(Reduced facsimiles of our labels.)

In ordering, please specify whether our "REGULAR," "RAPID," "EXTRA RAPID" or "ELECTRIC RAPID" PRINTING solution is desired.

No. 17. **"HYPERION SATIN." Medium thick.**

	Width,	30 in.	36 in.	42 in.	54 in.
Per roll of 10 yds., prepared,		$0 95	$1 10	$1 25	$1 95
" 50 " "		4 50	5 20	5 80	8 75

No. 18. **"HYPERION SATIN." Thick.**

	Width,	30 in.	36 in.	42 in.
Per roll of 10 yds., prepared,	. . .	$1 10	$1 30	$1 50
" 50 " "	. . .	5 20	6 00	6 80

No. 222. **"HYPERION PARCHMENT." Extra thin.**

	Width,	30 in.	36 in.	42 in.
Per roll of 10 yds., prepared,	. . .	$0 85	$1 00	$1 15
" 50 " "	. . .	3 60	4 30	5 20

No. 223. **"HYPERION PARCHMENT." Thin.**

	Width,	24 in.	30 in.	36 in.	42 in.	54 in.
Per roll of 10 yds., prepared,		$0 77	$0 92	$1 05	$1 20	$1 80
" 50 " "		3 30	4 00	4 60	5 25	7 80

No. 224. **"HYPERION PARCHMENT." Medium thick.**

	Width,	24 in.	30 in.	36 in.	42 in.
Per roll of 10 yds., prepared,		$1 00	$1 20	$1 40	$1 55
" 50 " "		4 30	5 25	6 15	7 00

No. 225. **"HYPERION PARCHMENT." Thick.**

	Width,	30 in.	36 in.	42 in.
Per roll of 10 yds., prepared,	. . .	$1 65	$1 85	$2 05
" 50 " "	. . .	7 00	8 25	9 35

No. 226. **"HYPERION" BLUE PRINT CLOTH. Medium.**

	Width,	30 in.	36 in.	42 in.	54 in.
Per roll of 10 yds., prepared,		$2 90	$3 20	$4 40	$6 00

No. 226T. **"HYPERION" BLUE PRINT CLOTH. Extra thin.**

	Width,	30 in.	36 in.	42 in.
Per roll of 10 yds., prepared,	. . .	$3 70	$4 00	$5 20

For description of papers, see page 24.

Samples of Unprepared Blue Print Papers mailed on application, or general Sample Book for 15 cents.

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"UNION" BLUE PRINT PAPERS

DAILY FRESHLY PREPARED *Medium Grade*

(Reduced facsimiles of our labels.)

Prepared with our "REGULAR," "RAPID," "EXTRA RAPID" or "ELECTRIC RAPID" PRINTING solutions.

No. 215. **"UNION SATIN." Medium thick.**

	Width,	30 in.	36 in.	42 in.
Per roll of 10 yds., prepared,	. . .	$0 70	$0 80	$0 90
" 50 " "	. . .	3 00	3 50	4 00

No. 216. **"UNION SATIN." Thick.**

	Width,	30 in.	36 in.	42 in.
Per roll of 10 yds., prepared,	. . .	$0 90	$1 00	$1 10
" 50 " "	. . .	4 00	4 50	5 00

No. 219. **"UNION PARCHMENT." Thin.**

	Width,	30 in.	36 in.	42 in.
Per roll of 10 yds., prepared,	. . .	$0 60	$0 70	$0 80
" 50 " "	. . .	2 50	3 00	3 50

No. 220. **"UNION PARCHMENT." Medium thick.**

	Width,	30 in.	36 in.	42 in.
Per roll of 10 yds., prepared,	. . .	$0 80	$0 90	$1 00
" 50 " "	. . .	3 50	4 00	4 50

In ordering, please specify whether the "REGULAR," "RAPID," "EXTRA RAPID" or "ELECTRIC RAPID" PRINTING solution is desired.

For description of papers, see page 24.

We can furnish any of our Prepared Papers cut into sheets, as special machinery has been installed for this purpose.

For Unprepared Papers, see page 28. For Tubes for preserving paper, see Nos. 243–248I. For Blue Print Cloth, see Nos. 226–226T.

Samples of Unprepared Blue Print Papers mailed on application, or general Sample Book for 15 cents.

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UNPREPARED BLUE PRINT PAPERS AND CLOTH

No. 200R. **"RADIANT SATIN."** **Medium thick.** (No. 207 is the same paper prepared.)

Width,	30 in.	36 in.	42 in.	54 in.
Per roll of 50 yds., unprepared,	$4 20	$4 95	$5 50	$7 40

No. 201R. **"RADIANT SATIN."** **Thick.** (No. 209 is the same paper prepared.)

Width,	30 in.	36 in.	42 in.
Per roll of 50 yds., unprepared	$4 95	$5 75	$6 65

No. 202R. **"RADIANT PARCHMENT."** **Extra thin.** (No. 211 is the same paper prepared.)

Width,	30 in.	36 in.	42 in.
Per roll of 50 yds., unprepared,	$3 05	$3 60	$4 15

No. 203R. **"RADIANT PARCHMENT."** **Thin.** (No. 212 is the same paper prepared.)

Width,	30 in.	36 in.	42 in.	54 in.
Per roll of 50 yds., unprepared,	$3 60	$4 40	$4 95	$6 90

No. 204R. **"RADIANT PARCHMENT."** **Medium thick.** (No. 213 is the same paper prepared.)

Width,	30 in.	36 in.	42 in.
Per roll of 50 yds., unprepared,	$4 15	$4 95	$5 75

No 205R. **"RADIANT PARCHMENT."** **Thick.** (No. 214 is same paper prepared.)

Width,	30 in.	36 in.	42 in.
Per roll of 50 yds., unprepared,	$4 95	$5 50	$6 00

No. 200. **"HYPERION SATIN."** **Medium thick.** (No. 17 is the same paper prepared.)

Width,	30 in.	36 in.	42 in.	54 in.
Per roll of 50 yds., unprepared,	$3 15	$3 65	$4 25	$5 75

No. 201. **"HYPERION SATIN."** **Thick.** (No. 18 is the same paper prepared.)

Width,	30 in.	36 in.	42 in.
Per roll of 50 yds , unprepared,	$3 65	$4 60	$5 30

No. 203. **"HYPERION PARCHMENT."** **Thin.** (No. 223 is the same paper prepared.)

Width,	30 in.	36 in.	42 in.	54 in.
Per roll of 50 yds., unprepared,	$2 65	$3 00	$3 65	$4 95

No. 204. **"HYPERION PARCHMENT."** **Medium thick.** (No. 224 is the same paper prepared.)

Width,	30 in.	36 in.	42 in.
Per roll of 50 yds., unprepared,	$4 00	$4 65	$5 30

No. 205. **"HYPERION PARCHMENT."** **Thick.** (No. 225 is the same paper prepared.)

Width,	30 in.	36 in.	42 in.
Per roll of 50 yds., unprepared,	$5 70	$6 70	$7 70

No. 206. **"HYPERION CLOTH."** **Medium.** (No. 226 is the same cloth prepared.)

Width,	30 in.	36 in.	42 in.	54 in.
Per roll of 10 yds., unprepared,	$2 40	$2 70	$3 80	$4 60

No. 206T. **"HYPERION CLOTH."** **Extra thin.** (No. 226T is the same cloth prepared.)

Width,	30 in.	36 in.	42 in.
Per roll of 10 yds., unprepared,	$3 20	$3 50	$4 60

No. 208. **"UNION SATIN."** **Medium thick.** (No. 215 is the same paper prepared.)

Width,	30 in.	36 in.	42 in.
Per roll of 50 yds., unprepared,	$2 00	$2 50	$3 00

No. 208½. **"UNION SATIN."** **Thick.** (No. 216 is the same paper prepared.)

Width,	30 in.	36 in.	42 in.
Per roll of 50 yds., unprepared,	$2 75	$3 25	$3 75

No. 210. **"UNION PARCHMENT."** **Extra thin.** (No. 219 is the same paper prepared.)

Width,	50 in.	36 in.	42 in.
Per roll of 50 yds., unprepared,	$1 75	$2 25	$2 75

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VANDYKE SOLAR PAPER

The most satisfactory Solar Process Paper in the market for making Dark Brown or Black Negative Prints and Positive Blue or Black Prints on Paper or Cloth.

For distinctness of outline, clearness of copy, and permanency of results it is unsurpassed, besides possessing all the following essential qualities:

1. Is easily manipulated.
2. Keeps exceedingly well.
3. Does not become brittle.
4. Prints rapidly.
5. Saves original tracing.
6. Cannot spoil positive prints by over-exposure.
7. Patent office drawings easily reproduced.

The **Vandyke Solar Paper** was first introduced and pertected by us, and, although several imitations have appeared upon the market, it still retains its title to being the leading paper of its kind.

DESCRIPTION OF ITS USE AND MANNER OF PRINTING.

From the original tracing a negative copy is made on thin Vandyke paper with white transparent lines on an opaque dark brown background. This negative copy is used in place of the original tracing to produce:

Positive Copies—as many as are required,

either

Black Line Prints with a White Background,
by printing on Vandyke paper with an exposure of about five minutes in good sunlight,

or

Blue Line Prints with a White Background,
by printing on **regular** blue print paper, with about seven minutes' exposure in good sunlight, or on **rapid** blue print paper, with about two minutes' exposure in good sunlight.

Similar results obtained on **Cloth** by using either prepared Blue print cloth or Vandyke cloth as may be desired.

The "Prints" made from this paper are absolutely permanent, and may be **Colored, Altered or Added To,** the same as original drawings.

If properly protected from light and moisture, the prepared paper will retain its strength and printing qualities for many months.

Samples of any of our sensitized papers cheerfully furnished on application.

For prices see next page.

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"VANDYKE" SOLAR PAPERS AND CLOTH

FOR NEGATIVE AND POSITIVE PRINTS

(Reduced facsimiles of our labels.)

No. 227. "VANDYKE" Solar Paper. Medium thick.

Width,	30 in.	36 in.	42 in.	54 in.
Per roll of 10 yds., prepared,	$1 75	$2 00	$ 2 25	$ 4 00
" 50 " "	8 50	9 75	11 00	19 50

No. 229. "VANDYKE" Solar Paper. Thin. For mailing and for negative prints.

Width,	30 in.	36 in.	42 in.	54 in.
Per roll of 10 yds., prepared,	$1 75	$2 00	$ 2 25	$ 4 00
" 50 " "	8 50	9 75	11 00	19 50

The thin and most transparent No. 229 Vandyke Solar Paper is, of course, the most suitable to make negative copies on.

No. 231. "VANDYKE" CLOTH. Medium.

Width,	30 in.	36 in.	42 in.	54 in.
Per roll of 10 yds., prepared,	$4 00	$4 50	$5 75	$9 50

No. 232. "VANDYKE" CLOTH. Extra thin.

Width,	30 in.	36 in.	42 in.
Per roll of 10 yds., prepared, . .	$5 00	$5 50	$6 60

Prints made on our Extra Thin Vandyke Cloth No. 232 are invaluable as shop records where the articles manufactured are standardized, since erasures and additions can readily be made on same. On account of the transparency of the cloth the prints can be used as tracings showing the progress of manufacture. in this manner doing away with the necessity of tedious duplicating and tracing by hand

Fixing Salt and full directions accompany every roll.

VANDYKE FIXING SALT.

For intensifying and fixing prints.

No. 233A.	Per 2-ounce can, ...	$0 10
233B.	Per 4-ounce can, ...	15
233C.	Per 1-pound can, ...	40

For description of Paper see page 29. For Tubes for preserving paper, see Nos. 243-248I.

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DIRECT PROCESS PAPERS

"LUMINE" DIRECT BLUE LINE PAPER

"UNAQUA" DIRECT BLACK LINE PAPER

(Reduced facsimiles of our labels)

"Lumine" Direct Blue Line Paper is of excellent keeping quality, and gives sharp, clear, permanent prints. It is exposed like Blue Print Paper, and after exposure the print is placed on a board, face upward, while the developing solution is brushed over the surface. It is then washed with clear water and placed in a fixing bath, after which it is again washed.

Detailed Directions, Developer and Fixer furnished with each roll.

No. 234A. **"LUMINE"** Direct Blue Line Paper. **Highest Grade. Medium thick.**

	Width, 30 in.	36 in.	42 in.
Per roll of 50 yds., prepared,	$6 25	$7 25	$8 25

No. 234B. **"LUMINE"** Direct Blue Line Paper. **Highest Grade. Thin.**

	Width, 30 in.	36 in.	42 in.
Per roll of 50 yds., prepared,	$6 00	$7 00	$8 00

No. 235A. **"LUMINE"** Direct Blue Line Paper **High Grade. Medium thick.**

	Width, 30 in.	36 in.	42 in.
Per roll of 50 yds., prepared,	$5 00	$5 60	$6 25

No. 235B. **"LUMINE"** Direct Blue Line Paper. **High Grade. Thin.**

	Width, 30 in.	36 in.	42 in.
Per roll of 50 yds., prepared,	$4 50	$5 10	$5 75

"Unaqua" Direct Black Line Paper is exposed and washed exactly like Blue Print Paper, **requiring only one water bath; no chemical bath is necessary.** Will keep fresh for several months, and does not become brittle with age. Clear, distinct lines on a white background are obtained.

No. 238A. **"UNAQUA"** Direct Black Line Paper. **Highest Grade. Medium thick.**

	Width, 30 in.	36 in.	42 in.
Per roll of 10 yds., prepared,	$2 50	$3 00	$3 50

No. 238B. **"UNAQUA"** Direct Black Line Paper. **Highest Grade. Thin.**

	Width, 30 in.	36 in.	42 in.
Per roll of 10 yds., prepared,	$2 50	$3 00	$3 50

Samples of any of our sensitized papers cheerfully furnished on application.

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ADHESIVE TAPES

No. 239A.

No. 239A. **STYK-UM-PHAST.** A mounting and binding tape, made of cloth ⅞ inches wide, coated on one side with a strong adhesive glue compound. Put up in a special designed box which fully protects the tape from atmospheric and other deteriorating effects.
Per box of 50 ft., ... $0 25

No. 239B. **DENNISON'S ADHESIVE TRANSPARENT TAPE.** Strip of Paper 4 ft. long, ¾ inch wide, gummed on one side, on spool with metal holder.
Per dozen spools, ... $0 60

ERASING FLUIDS

For making alterations on Blue or Black Prints.

No. 240. **White Hyperion Erasing Fluid.** For making alterations and additions on blue prints.
Per bottle, ... $0 20

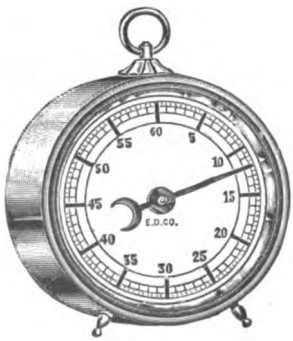
241. **Red Hyperion Erasing Fluid.** For marking or tinting blue prints.
Per bottle, ... $0 20

241½. **Yellow Hyperion Erasing Fluid.** For marking or tinting blue prints.
Per bottle, ... $0 20

242. **Vandyke Erasing Fluid.** For making alterations on Vandyke prints.
Per bottle, ... $0 20

No. 240.

CHRONO PHOTOMETER



No. 242C.

No. 242C. **CHRONO PHOTOMETER.** Each, $2 50
The Chrono Photometer is excellent for use in Blue Printing departments to insure accurate timing of exposure. Uniform prints are obtained, and waste due to under-exposed or burned prints is eliminated.

The Photometer is of simple, durable construction, and runs for twenty-seven hours with one winding. Times exposures in minutes, seconds and half-seconds.

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AIR-TIGHT METAL TUBES

For Preserving Paper.

No. 243.

Made of tin, with well fitting covers; for keeping cut rolls of prepared Blue Print and Vandyke papers dry and dark, and also well adapted for the safe keeping of valuable plans and tracings.

No. 243.	For 50-yd. rolls,	31 in.	long,	Each.	$1 10
244.	"	37 "	"	"	1 25
245.	"	43 "	"	"	1 35
246.	"	55 "	"	"	2 00
243½.	For 10-yd. rolls,	31 "	"	"	95
244½.	"	37 "	"	"	1 00
245½.	"	43 "	"	"	1 10
246½.	"	55 "	"	"	1 70

PASTEBOARD TUBES

No. 246A.

These Tubes are made with close-fitting caps at each end, and are used for preserving 10-yard rolls of prepared paper; also for mailing and keeping drawings, tracing cloth, etc.

No. 246A.	2 in.	diameter,	31 in.	long,	Each, $0 08
246B.	2 "	"	37 "	"	" 09
246C.	2 "	"	43 "	"	" 10
247A.	2½ "	"	31 "	"	" 10
247B.	2½ "	"	37 "	"	" 12
247C.	2½ "	"	43 "	"	" 15

HEAVY PASTEBOARD TUBES

No. 248A.

Made of extra heavy pasteboard, with metal screw cap on one end and fixed metal cap on the other end. They are dust-proof, moist-proof, light-proof; very durable, and excellent for expressing or filing drawings, tracings, etc.

No. 248A.	2 in.,	inside diameter,	32 in.	long,	Each, $0 30
248B.	2 "	"	37 "	"	" 35
248C.	2 "	"	43 "	"	" 40
248D.	2¾ "	"	32 "	"	" 45
248E.	2¾ "	"	37 "	"	" 50
248F.	2¾ "	"	43 "	"	" 55
248G.	3½ "	"	32 "	"	" 60
248H.	3½ "	"	37 "	"	" 65
248I.	3½ "	"	43 "	"	" 70

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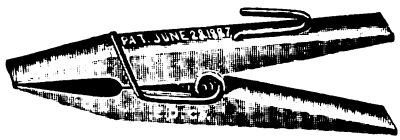
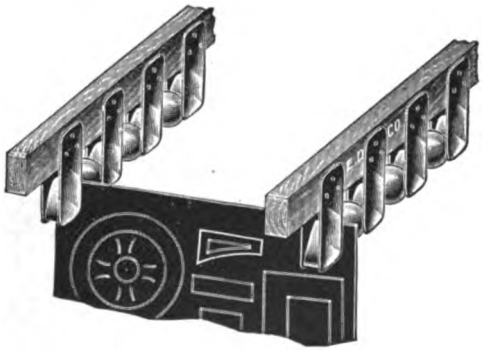
SPRING CLIPS



No. 248½.

No. 248½. Spring Clips, for clamping prints when drying, Per doz., $0 25

DIETZGEN AUTOMATIC PRINT HANGER



No. 249A.

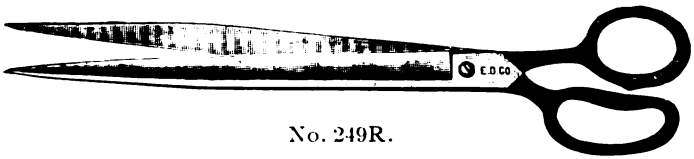
		Each bar.
No. 249A.	Dietzgen Automatic Print Hanger, bar with 10 holders,	$1 40
249B.	" " " " " " 20 "	2 75
249C.	" " " " " " 25 "	3 50
249D.	" " " " " " 30 "	4 25
249E.	" " " " " " 35 "	5 00

The Dietzgen Automatic Print Hanger is unequaled for drying Blue Prints, etc. It consists of metal holders attached to a rigid wooden bar, each holder containing a ball. The print is slipped between the edge of the holder and the ball, and when released is held firmly in a vertical position by the weight of the ball. The print is quickly removed by simply raising the ball with the finger.

The Hanger not only saves time and labor, but also economizes space and prevents the tearing and crumpling of prints. All parts are made of non-corrosive material and *will not rust*. The metal holders are spaced so that the air circulates freely between the prints, insuring quick drying.

One or two bars should be used for small or medium size prints; for large prints additional bars will be necessary to prevent the prints from sagging.

TRIMMING SHEARS



No. 249R.

No. 249R.	Trimming Shears, 14 inches, ...	Each, $2 00
249S.	" " 16 "	" 2 60
249T.	" " 18 "	" 3 75

These Shears are especially adapted for trimming blue prints, drawings, tracings, etc. Made of high-grade material, with long thin blades of perfect temper and true cutting edges. Japanned handles, and nickeled blades.

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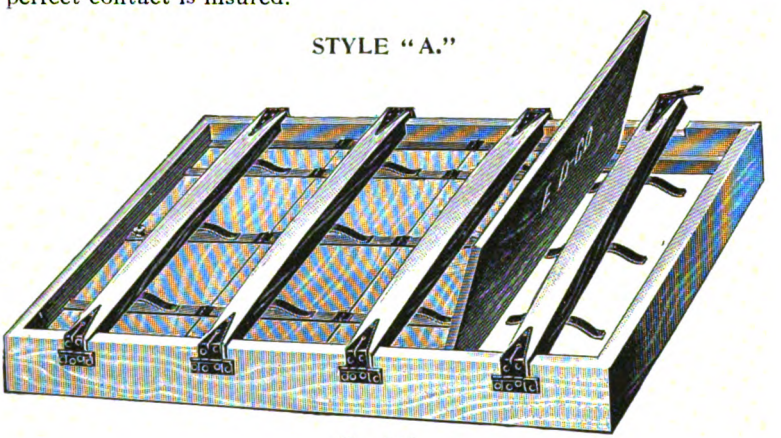
BLUE PRINT FRAMES

SUPERIOR QUALITY OF HARDWOOD

Special attention is given to the manufacture of our Blue Print Frames. All our Frames are of perfect workmanship; are made of selected stock thoroughly seasoned in our own yards, and are less liable to warp and shrink, and thereby break the glass, than any other frames made. The springs are of rolled hard spring brass and **will not rust**, while their arrangement is such that perfect contact is insured.

STYLE "A."



No. 254.

Made of selected Hardwood, highly finished, with hinged bars and brass springs.

	Inside Dimensions of Frame.	Printing Surface.		Frame Only.	With Felt Pad.	With Felt Pad and Double Thick Glass.	With Felt Pad and Polished Plate Glass.
No. 250.	21½ × 25½ in.	20 × 24 in.	Each,	$ 6 85	$ 7 60	$ 9 25	$10 40
251.	25½ × 31½ "	24 × 30 "	"	8 80	9 90	12 50	15 25
252.	25½ × 37½ "	24 × 36 "	"	10 50	12 25	.....	19 30
253.	32 × 44 "	30 × 42 "	"	13 90	15 90	.....	24 90
253A.	38 × 50 "	36 × 48 "	"	18 00	20 60	.....	34 90
254.	38 × 62 "	36 × 60 "	"	22 50	25 75	.....	43 50
254A.	44 × 62 "	42 × 60 "	"	24 75	28 50	.....	49 00
254B.	44 × 74 "	42 × 72 "	"	32 00	36 50	.....	62 00

Other sizes made to order.

In ordering Frames, please state whether felt pad and double thick or polished plate glass is desired, or none.

We recommend ordering the Plate Glass, because it is more perfect and lasting than Double Thick Glass.

The Glass is carefully packed by an expert, but we are not responsible for breakage of glass in transit.

BLUE PRINT FRAMES FOR PATENT OFFICE DRAWINGS, ETC.

No. 252A.	11 × 16 inches, with double thick glass and pad, .	Each, $3 50
252B.	16 × 21 " with double thick glass and pad, .	" 5 50

FELT FOR PRINTING FRAMES

No. 255.	70 inches wide, ¼ inch thick, ...	Per yard, $3 00
256.	70 " " ⅜ " "	" " 4 50

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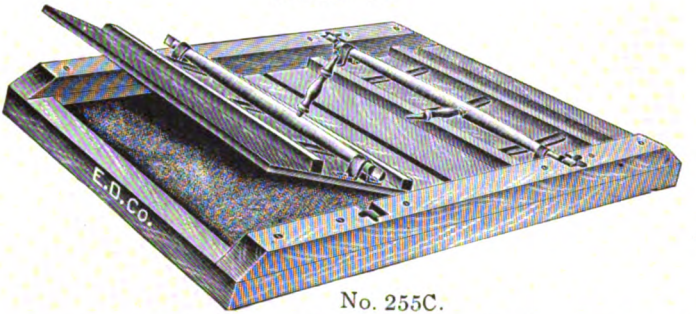
BLUE PRINT FRAMES *Continued*

STYLE "B."

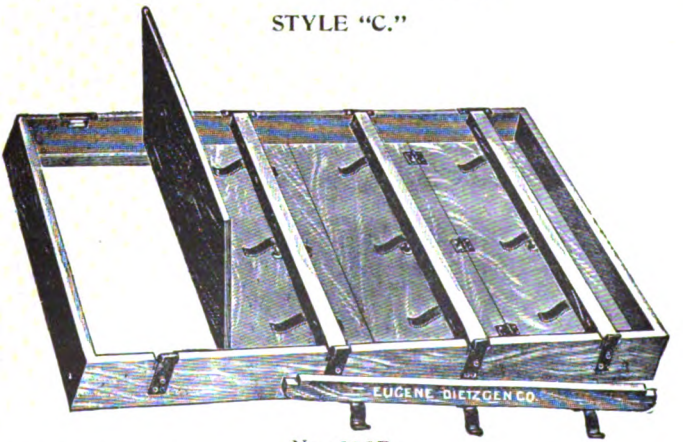


No. 255C.

These Frames differ from the ordinary construction in that the springs are fastened to the back instead of the usual cross bars, and the necessary tension—to produce good contact—is applied by a new clamping device, of simple construction, which eliminates the cross bars and is rapidly and easily operated.

	Printing Surface.		Frame Only.	With Felt Pad.	With Felt Pad and Double Thick Glass.	With Felt Pad and Polished Plate Glass.
No. 255A.	20 × 24 in.	Each,	$ 7 40	$ 8 10	$ 9 20	$10 35
255B.	24 × 30 "	"	9 50	10 50	12 25	15 00
255C.	24 × 36 "	"	11 50	12 75		19 90
255D.	30 × 42 "	"	14 50	16 25		25 25

STYLE "C."



No. 256D.

Made of Hardwood, with separate bars and brass springs.

	Inside Dimensions of Frame.	Printing Surface.		Frame Only.	With Felt Pad.	With Felt Pad and Double Thick Glass.	With Felt Pad and Polished Plate Glass.
No. 256A.	21½ × 25½ in.	20 × 24 in.	Each,	$ 6 10	$ 6 75	$ 8 40	$ 9 55
256B.	25½ × 31½ "	24 × 30 "	"	7 60	8 70	11 30	14 00
256C.	25½ × 37½ "	24 × 36 "	"	9 15	10 90		17 95
256D.	32 × 44 "	30 × 42 "	"	12 15	14 15		23 15
256E.	38 × 50 "	36 × 48 "	"	15 00	17 60		31 90
256F.	38 × 62 "	36 × 60 "	"	18 25	21 50		39 25

In ordering Frames, please state whether felt pad and double thick or polished plate glass is desired, or none.

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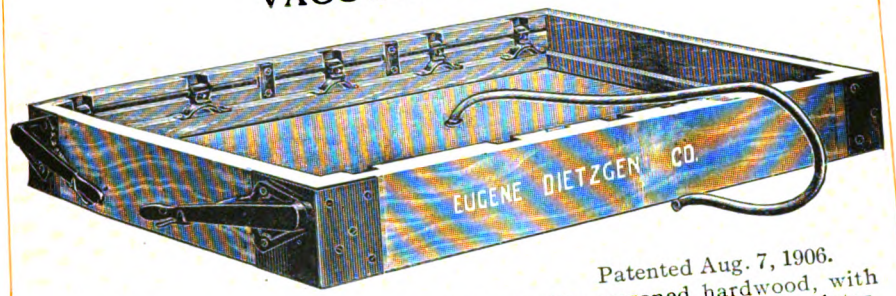
VACUUM FRAMES



Patented Aug. 7, 1906.

No. 257B.

Our Vacuum Frames are made of thoroughly seasoned hardwood, with steel mountings, and the corners are reinforced with rectangular steel plates. They include a specially constructed air-proof rubber cushion with pad, exhaust valve and hose, by means of which the air is entirely exhausted between the cushion and glass, insuring good contact.

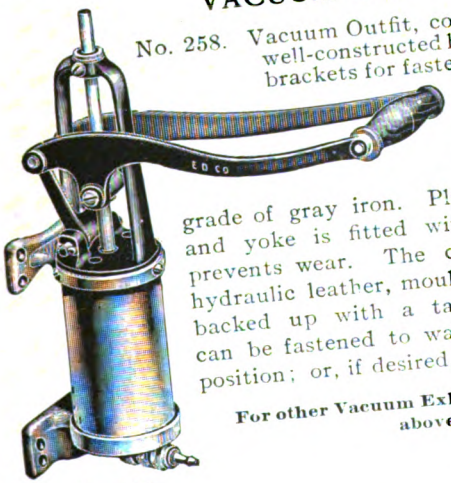
They are particularly well adapted for Vandyke Negative and Positive printing, also for printing off large tracings, which are very liable to wrinkle in ordinary spring frames, resulting in blurred prints. With our Vacuum Frames this defect is eliminated, as perfect contact of paper and tracing with glass is secured, and, as the atmospheric pressure is the same on both sides of the glass, it obviates the danger of breakage, which frequently occurs with ordinary spring or air cushion frames.

		Inside Dimensions of Frame.	Printing Surface.	Without Glass.	With Polished Plate Glass.
No. 257A.	Vacuum Frame,	32 × 44 in.	30 × 42 in.	Each, $55 00	$ 63 50
257AL.	" "	38 × 50 "	36 × 48 "	" 64 50	80 50
257B.	" "	38 × 62 "	36 × 60 "	" 72 00	92 00
257C.	" "	45 × 75 "	42 × 72 "	" 97 50	125 75

Other sizes made to order.

In ordering, please state whether Frame is desired with or without glass.

VACUUM EXHAUST OUTFIT



No. 258.

No. 258. Vacuum Outfit, consisting of a powerful and well-constructed hand pump, with heavy brass brackets for fastening to wall or floor, Each, $10 00

The cylinder of this pump is special heavy gauge seamless brass tubing. The yokes, levers, links and crossheads are of the finest grade of gray iron. Plunger rod is one-half inch steel, and yoke is fitted with a bronze metal bushing which prevents wear. The cup leather is of the best grade hydraulic leather, moulded and machined by hand, and is backed up with a tapering plunger plate. This Pump can be fastened to wall in either a vertical or horizontal position; or, if desired, can be attached to floor.

For other Vacuum Exhaust Outfits, for use in connection with above Frames, see next page.

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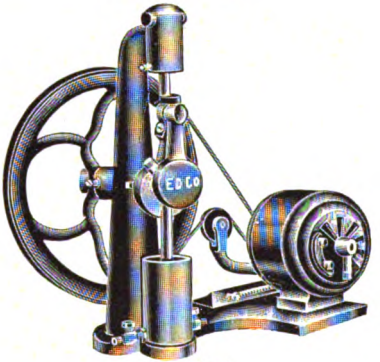
VACUUM EXHAUST OUTFITS

For use in connection with our Vacuum Blue Print Frames Nos. 257A-257C.

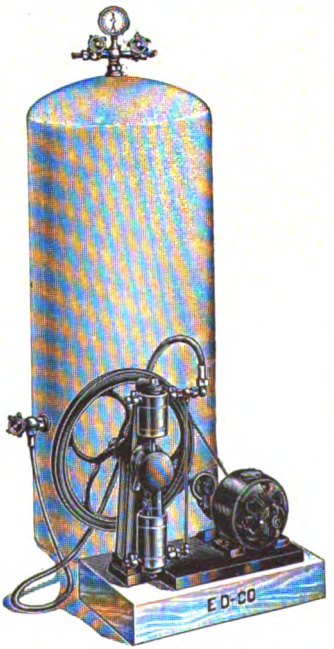


No. 259A.

No. 259A. Vacuum Outfit, consisting of Single Acting Pump, Sub-base and Motor for 110-volt Direct Current, ... Each, $60 00

259B. Vacuum Outfit, like No. 259 A, but with Motor for 110-volt Alternating Current, ... Each, 67 50

These Pumps can be used for either continuous or interrupted service. They require less operating power than any other single acting pump of equal capacity. Very little floor space is necessary.



No. 260.

No. 260. Vacuum Outfit, with large steel Tank, Motor (110-volt D. C.) Double Acting Pump, Gauge, etc. . . Each, $200 00

Outfit No. 260 consists of an exhaust tank, with motor and all necessary accessories, by means of which the air is automatically exhausted from the printing frames, no manual labor being required. A connection is made between the tank and the frame or frames used, by iron pipe or rubber hose.

Stock Tank Outfits are equipped with 110-volt Direct Current motor, but motors for any other voltage furnished to order.

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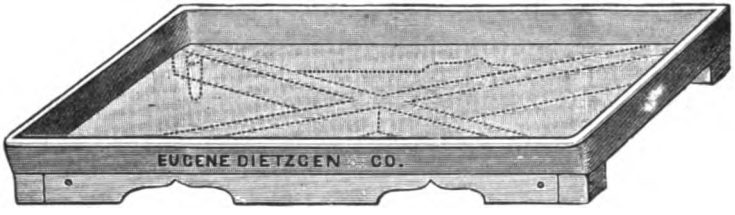
SUPERIOR LEAD LINED BATH TRAYS

No. 262A.

The Frame is of substantial hardwood construction and is lined with sheet lead. Each Tray is provided with a drain pipe and a nipple for waste pipe connection. Superior to all other trays, as chemicals or acids will not corrode lead, while they are injurious to other metals. Especially adapted for washing and fixing "Vandyke" or "Lumine" prints.

No. 262A.	Bath Tray, lead lined,	20 × 24	inches,	. . . .	Each,	$ 5 90
262B.	" " " "	24 × 30	"	. . . .	"	7 25
262C.	" " " "	30 × 42	"	. . . .	"	9 50
262D.	" " " "	36 × 60	"	. . . .	"	13 80
262E.	" " " "	42 × 60	"	. . . .	"	18 40
262F.	" " " "	45 × 75	"	. . . .	"	23 50

GALVANIZED IRON BATH TRAYS



No. 264A.

With Drain Pipe, strong Rim and Wooden Braces.

No. 264A.	Bath Tray,	20 × 24	inches,	. . . . .	Each,	$ 4 50
264B.	"	24 × 30	"	. . . . .	"	5 50
264C.	"	30 × 42	"	. . . . .	"	7 00
264D.	"	36 × 60	"	. . . . .	"	9 00
264E.	"	42 × 60	"	. . . . .	"	11 25
264F.	"	45 × 75	"	. . . . .	"	14 00

Other sizes made to order.

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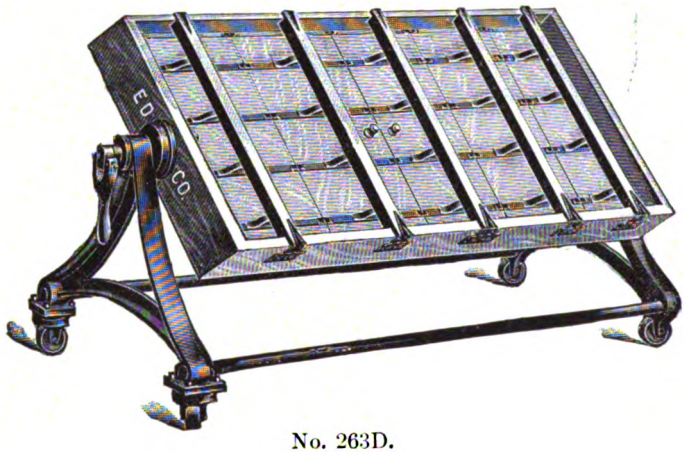
FRAMES ON WHEEL CARRIAGES



No. 263D.

These Carriages are made of iron in a very practical and substantial manner. The Frames are the same as those listed under Nos. 250 to 254B, but are mounted so that they revolve in the uprights of the carriage and can be clamped at any angle to receive the direct rays of the sun.

Carriage with Style "A" Frame.

	Inside Dimensions of Frame.	Printing Surface.		Without Glass or Felt Pad.	With Felt Pad.	With Felt Pad and Polished Plate Glass.
No. 263A.	25½ × 37½ in.	24 × 36 in.	Each,	$31 50	$33 25	$40 25
263B.	32 × 44 "	30 × 42 "	"	35 50	37 50	46 50
263C.	38 × 50 "	36 × 48 "	"	41 50	44 10	58 40
263D.	38 × 62 "	36 × 60 "	"	47 50	50 75	68 50
263E.	44 × 62 "	42 × 60 "	"	50 75	54 50	75 00
263F.	44 × 74 "	42 × 72 "	"	59 00	63 50	89 00

Carriage with Vacuum Frame.

	Inside Dimensions of Frame.	Printing Surface.		Without Glass.	With Polished Plate Glass.
No. 263K.	32 × 44 in.	30 × 42 in.	Each,	$ 76 50	$ 85 00
263L.	38 × 50 "	36 × 48 "	"	88 00	103 75
263M.	38 × 62 "	36 × 60 "	"	97 00	116 50
263N.	45 × 75 "	42 × 72 "	"	123 50	151 50

These Vacuum Frames are the same as those listed under Nos. 257A to 257C, and include rubber cushion with pad, exhaust valve and hose.

Other sizes made to order.

In ordering, please state whether Frame is desired with or without glass.

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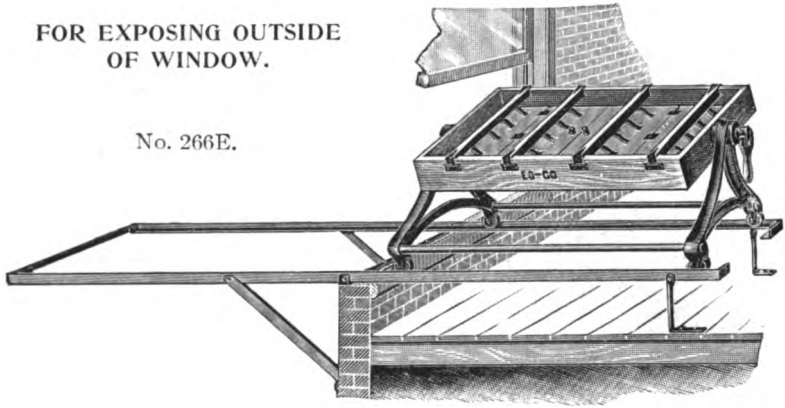
FRAMES WITH CARRIAGES ON RAILS

FOR EXPOSING OUTSIDE OF WINDOW.

No. 266E.



This is the most practical and durable track arrangement upon which frames on Carriages may be run out of a window for exposure. The carriage is of substantial iron construction, of new design, and runs on four iron wheels. The rails usually furnished are of angle iron, but we can also furnish them of channel iron if so ordered. The frames are the same as those listed under Nos. 250 to 254B, but are mounted so that they revolve in the uprights of the carriage and can be clamped in any position.

Style "A" Frame and Carriage complete with iron rails and supports:

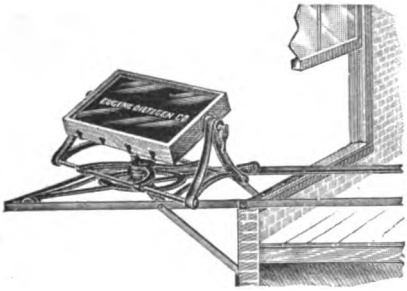
	Inside Dimensions of Frame.	Printing Surface.		Without Glass or Felt Pad.	With Felt Pad.	With Felt Pad and Polished Plate Glass.
No. 266E. Frame,	32 × 44 in.	30 × 42 in.	Each,	$39 75	$41 75	$50 75
266F. "	38 × 50 "	36 × 48 "	"	47 75	50 35	64 65
266G. "	38 × 62 "	36 × 60 "	"	54 75	58 00	75 75
266H. "	44 × 74 "	42 × 72 "	"	68 75	73 25	98 75

In ordering, please state width and height of open window, width of window sill, height of window sill from floor, and thickness of wall.

Vacuum Frame and Carriage complete with iron rails and supports:

	Inside Dimensions of Frame.	Printing Surface.		Without Glass.	With Polished Plate Glass.
No. 266K. Vacuum Frame,	32 × 44 in.	30 × 42 in.	Each,	$ 81 00	$ 89 50
266L. " "	38 × 50 "	36 × 48 "	"	93 50	109 50
266M. " "	38 × 62 "	36 × 60 "	"	104 50	124 00
266N. " "	45 × 75 "	42 × 72 "	"	133 00	161 00

These Vacuum Frames are the same as those listed under Nos. 257A to 257C, and include rubber cushion with pad, exhaust valve and hose.



In ordering, please state width and height of open window, width of window sill, height of window sill from floor, and thickness of wall.

TURNTABLE.

We can furnish above frames with our improved iron turntable (see cut), adjustable to direct rays of sun. As special carriage uprights are required, state if turntable is desired when ordering carriage.

No. 266T. Turntable, additional cost to above prices, . . Each, $20 00

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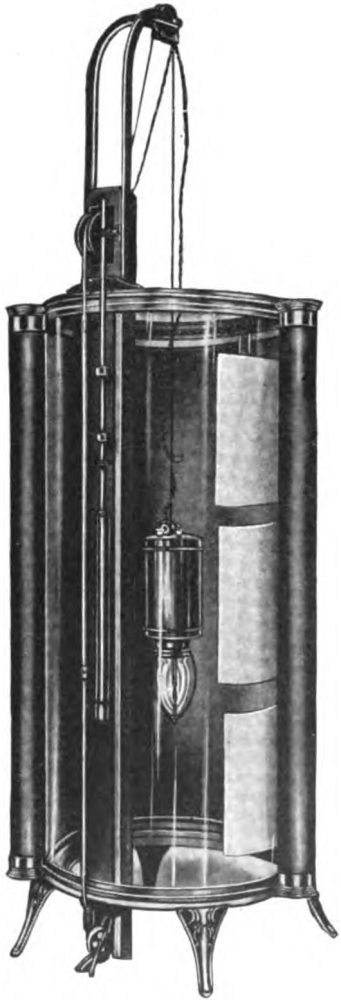
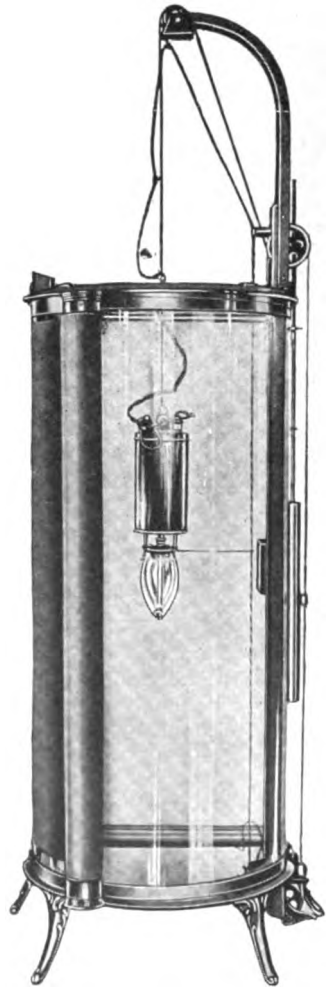
CYLINDRICAL ELECTRIC BLUE PRINT MACHINES

With Patent Roller Curtain.

These Electric Blue Printing Machines were designed to meet the growing demand for well constructed and thoroughly efficient apparatus for reproducing drawings and tracings at any time during the day or night, independent of weather conditions.



No. 267C.—Type "W."



No. 267E.—Type "X."

In the construction of these machines we have attained both practicability and simplicity, and by referring to illustrations and description, their superiority to machines of other make can readily be determined.

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ELECTRIC BLUE PRINT MACHINES

Continued

TYPE "W."

Description: It is of the cylindrical type, consisting of two sections of curved plate glass forming a cylinder, with an arc lamp arranged to descend axially through the cylinder, thereby giving **equal light radiation** on the interior surface of the cylinder, and hence a uniform exposure of the blue print paper.

The **Roller Curtain device** (patented) by which the tracings and sensitized paper are held in place, is by far the most efficient, convenient and accessible means ever devised for the purpose. The Roller stands perfectly still except when pushed along by hands or knee, **thus leaving both hands of the operator free** to adjust the tracings and paper. This device is particularly convenient for making a number of small prints; the illustration showing a partly filled cylinder. The roller curtain holds the tracings and paper so securely against the glass that at any time the rollers can be partly rolled back, permitting **an examination of the prints** without in any way disturbing the position of the tracings with respect to the prints, on the same principle as the old sun frames. This provision is only necessary, however, when using tracings of mixed transparency—old and soiled tracings requiring longer exposures than new ones.

The **Hydraulic Speed Regulator** secures an **absolutely uniform speed** at all times. It also provides a **wide range of speed regulation,** so that the machine may be adjusted to meet all possible requirements. By means of a valve regulator, the speed can be varied either before or after turning on the current. The machine is noiseless in operation.

The **Arc Lamp** furnished with the machine is of a special pattern and the best adapted for the purpose. It gives the highest actinic effect and a strong, uniform and steady light.

The machine is entirely **self-contained,** the mechanism not being dependent upon side walls or ceiling fixtures of any kind. On account of this feature, it can be placed in any part of a room desired. It occupies a **floor space only three feet square.**

This machine is designed on the **only correct principles of light radiation** and it excels in that it will print **small or large prints** with equal facility and perfection.

These machines are furnished all complete so that when set up, connection with the feed wire is only required.

No. 267C. Type "W," capacity two prints, each 42×60 in. Each, $280 00
267D. Type "W," capacity two prints, each 42×72 in. " 325 00

When ordering state voltage and whether direct or alternating current is used

TYPE "X."

To meet a large demand machines have been designed with one curved plate glass, which print but one sheet 42 x 60 or 42 x 72 inches or equivalent area at each exposure, and which sell at correspondingly lower prices. The controlling mechanism of this type is exactly the same as that used on the machines described above.

No. 267E. Type "X," capacity one print, 42×60 in. . . . . Each, $200 00
267F. Type "X," capacity one print, 42×72 in. . . . . " 220 00

When ordering state voltage and whether direct or alternating current is used.

Above prices include packing for shipment. We are not responsible for breakage of glass in transit.

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"PERFECT" PROFILE PAPERS AND CLOTHS

(Reduced facsimiles of our labels.)

Our **"Perfect" Profile and Cross Section Papers** are printed from engraved rollers on superior quality papers made expressly for this purpose, and are unexcelled for distinctness, accuracy and uniformity.

The Profile and Cross Section **Tracing Papers and Cloths** are especially adapted for use by engineers on construction, to transmit monthly progress of work, by tracing **direct** from their field profiles.

Our **"Hyperion"** (opaque) **Cloth** is recommended for out-door use, as it will stand rough handling; our **Tracing Cloths** are of the **"Imperial"** Brand.

All our Profile Papers bear the trade mark "Perfect" along their edge.

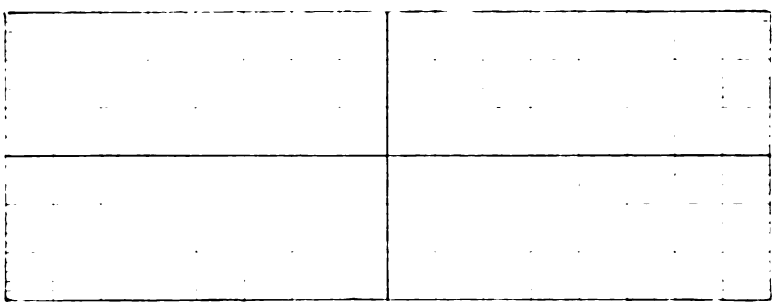

Plate A, 4 × 20 to one inch.

CONTINUOUS.

No.		Engraving				Roll.	Yard.
270	Green. On Drawing Paper,	20	in. wide,	50	yd. rolls,	$10 00	$0 24
270	Orange. " " "	20	"	50	"	10 00	24
270½	Green. " " "	10	"	50	"	6 25	15
270½	Orange. " " "	10	"	50	"	6 25	15
271	Green. Mounted on Muslin,	20	"	20	"	10 00	60
271	Orange. " " "	20	"	20	"	10 00	60
271½	Green. " " "	10	"	20	"	6 75	40
271½	Orange. " " "	10	"	20	"	6 75	40
272	Green. On **Hyperion Cloth,**	20	"	20	"	10 00	60
272	Orange. " " "	20	"	20	"	10 00	60
275	Orange. On **Tracing Paper,**	20	"	50	"	10 00	24
275½	Orange. " " "	10	"	50	"	6 25	15
276	Orange. On **Tracing Cloth,**	20	"	20	"	12 50	75

Samples of Profile and Cross Section Papers and Cloths mailed on application, or general Sample Book for 15 cents.

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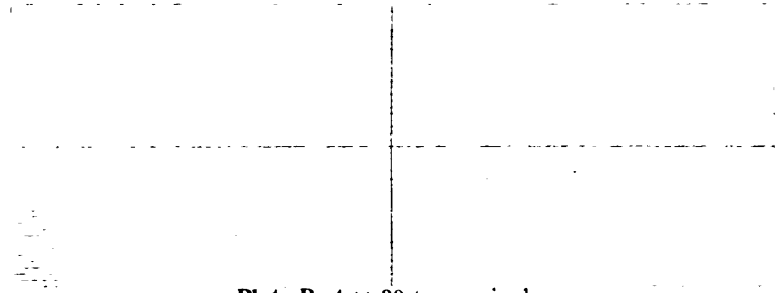
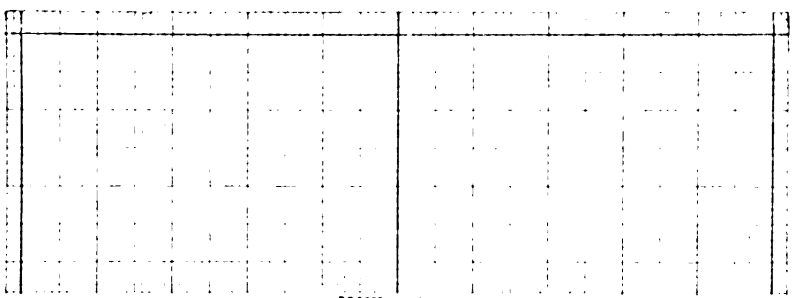


Plate B, 4 × 30 to one inch.

CONTINUOUS.

No.			Engraving			Roll.	Yard.
280	Green.	On Drawing Paper,	20 in.	wide,	50 yd. rolls,	$10 00	$0 24
280	Orange.	" " "	20 "		50 "	10 00	24
280½	Green.	" " "	9 "		50 "	6 25	15
280½	Orange.	" " "	9 "		50 "	6 25	15
281	Green.	Mounted on Muslin,	20 "		20 "	10 00	60
281	Orange.	" " "	20 "		20 "	10 00	60
281½	Green.	" " "	9 "		20 "	6 75	40
281½	Orange.	" " "	9 "		20 "	6 75	40
282	Green.	On **Hyperion Cloth,**	20 "		20 "	10 00	60
282	Orange.	" " "	20 "		20 "	10 00	60
285	Orange.	On **Tracing Paper,**	20 "		50 "	10 00	24
285½	Orange.	" " "	9 "		50 "	6 25	15
286	Orange.	On **Tracing Cloth,**	20 "		20 "	12 50	75



Millimeter.

CONTINUOUS.

No.			Engraving			Roll.	Yard.
300	Green.	On Drawing Paper,	50 cm.	wide,	50 yd. rolls,	$10 00	$0 24
300	Orange.	" " "	50 "		50 "	10 00	24
301	Green.	Mounted on Muslin,	50 "		20 "	10 00	60
301	Orange.	" " "	50 "		20 "	10 00	60
305	Orange.	On **Tracing Paper,**	50 "		50 "	10 00	24
306	Orange.	On **Tracing Cloth,**	50 "		20 "	.12 50	75

Samples of Profile and Cross Section Papers and Cloths mailed on application, or general Sample Book for 15 cents.

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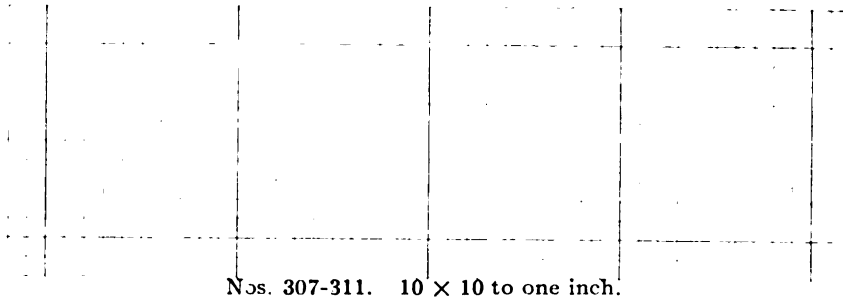
"PERFECT"
CROSS SECTION PAPERS AND CLOTHS
IN ROLLS AND SHEETS.

All our Printed Cross Section Papers bear the trade mark "Perfect" along their edge.



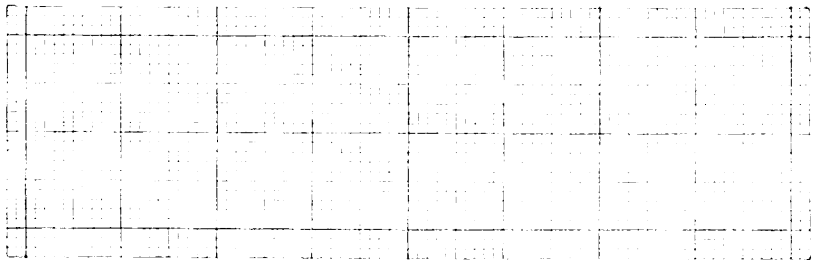
Nos. 307-311. 10 × 10 to one inch.

CONTINUOUS.

		Engraving			Roll.	Yard
No. 307	Green.	On Drawing Paper,	20 in. wide,	50 yd. rolls,	$10 00	$0 24
307	Orange.	" " "	20 " "	50 "	10 00	24
308	Green.	Mounted on Muslin,	20 " "	20 "	10 00	60
308	Orange.	" " "	20 " "	20 "	10 00	60
308½	Green.	On **Hyperion Cloth,**	20 " "	20 "	10 00	60
308½	Orange.	" " "	20 " "	20 "	10 00	60
309	Orange.	On **Tracing Paper,**	20 " "	50 "	10 00	24
309½	Orange.	On **Tracing Cloth,**	20 " "	20 "	12 50	75

SHEETS.

				Quire.	Sheet.
No. 310	Green.	On Ledger Paper, engraving	16 × 20 in.,	$3 50	$0 20
310	Orange.	" " " "	16 × 20 "	3 50	20
311	Orange.	On **Tracing Paper,** "	16 × 20 "	3 50	20



Nos. 315-319. 16×16 to one inch.

CONTINUOUS.

		Engraving			Roll.	Yard.
No. 315	Green.	On Drawing Paper,	20 in. wide,	50 yd. rolls,	$10 00	$0 24
315	Orange.	" " "	20 " "	50 "	10 00	24
316	Green.	Mounted on Muslin,	20 " "	20 "	10 00	60
316	Orange.	" " "	20 " "	20 "	10 00	60

SHEETS.

				Quire.	Sheet.
No. 318	Green.	On Ledger Paper, engraving	16 × 21 in.,	$3 50	$0 20
318	Orange.	" " " "	16 × 21 "	3 50	20
319	Orange.	On **Tracing Paper,** "	16 × 21 "	3 50	20

Samples of Profile and Cross Section Papers and Cloths mailed on application, or general Sample Book for 15 cents.

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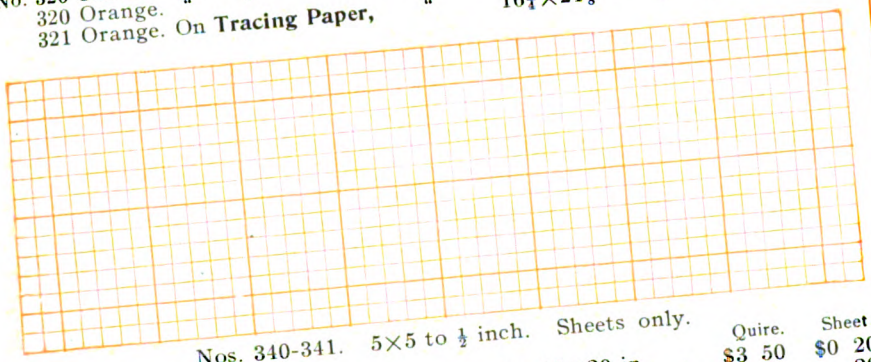
"PERFECT" CROSS SECTION PAPERS
IN SHEETS ONLY.

Continued

Nos. 320-321. 8×8 to one inch. Sheets only.

			Quire.	Sheet.
No. 320 Green.	On Ledger Paper, engraving	$16\frac{1}{4}\times21\frac{7}{8}$ in.,	$3 50	$0 20
320 Orange.	" " " "	$16\frac{1}{4}\times21\frac{7}{8}$ "	3 50	20
321 Orange.	On **Tracing Paper,** "	$16\frac{1}{4}\times21\frac{7}{8}$ "	3 50	20



Nos. 340-341. 5×5 to ½ inch. Sheets only.

			Quire.	Sheet.
No. 340 Green.	On Ledger Paper, engraving	16×20 in.,	$3 50	$0 20
340 Orange.	" " " "	16×20 "	3 50	20
341 Orange.	On **Tracing Paper,** "	16×20 "	3 50	20

No. 342. 12 × 12 to one inch. Sheets only.

			Quire.	Sheet.
No. 342 Green.	On Ledger Paper, engraving	16 × 20 in.,	$3 50	$0 20

Samples of Cross Section Papers mailed on application, or general Sample Book for 15 cents.

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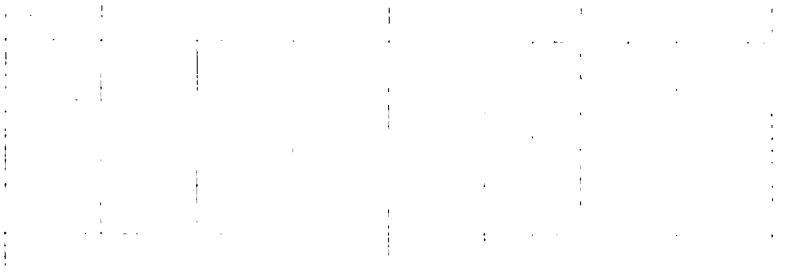
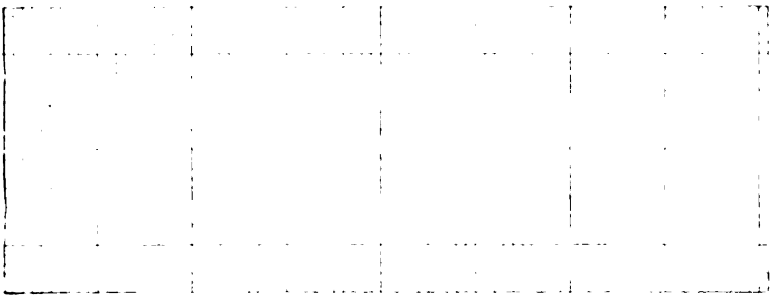
CONSTRUCTORS' CROSS SECTION PAPERS

For use of students, mechanical engineers, etc.



Nos. 343-346D. 10 × 10 to ½ inch. Every fifth line heavy.

			100 sheets.	Quire.
No. 343.	Engraving 5 × 7 in., on drawing paper,	green only,	$0 90	$0 25
344.	" 5 × 7 " " tracing "	orange "	90	25
344A.	" 5 × 7½ " " drawing "	green "	90	25
344B.	" 5 × 7½ " " tracing "	orange "	90	25
345.	" 7 × 10 " " drawing "	green "	1 20	30
346.	" 7 × 10 " " tracing "	orange "	1 20	30
346A.	" 7½ × 10 " " drawing "	green "	1 20	30
346B.	" 7½ × 10 " " tracing "	orange "	1 20	30
346C.	" 10 × 15 " " drawing "	green "	2 40	75
346D.	" 10 × 15 " " tracing "	orange "	2 40	75



Nos. 347-350. 20 × 20 to one inch. Every tenth line heavy.

			100 sheets.	Quire.
No. 347.	Engraving 5 × 7 in., on drawing paper,	green only,	$0 90	$0 25
348.	" 5 × 7 " " tracing "	orange "	90	25
349.	" 7 × 10 " " drawing "	green "	1 20	30
350.	" 7 × 10 " " tracing "	orange "	1 20	30

Nos. 351-352. 5 × 5 to one inch.

			100 sheets.	Quire.
No. 351.	Engraving 8 × 10 in., on drawing paper,	green only,	$1 75	$0 50
352.	" 8 × 10 " " tracing "	orange "	1 75	50

The printed cross section papers are more reliable and accurate than the ruled cross section papers and of a better stock of paper.

Samples of Cross Section Papers mailed on application, or general Sample Book for 15 cents.

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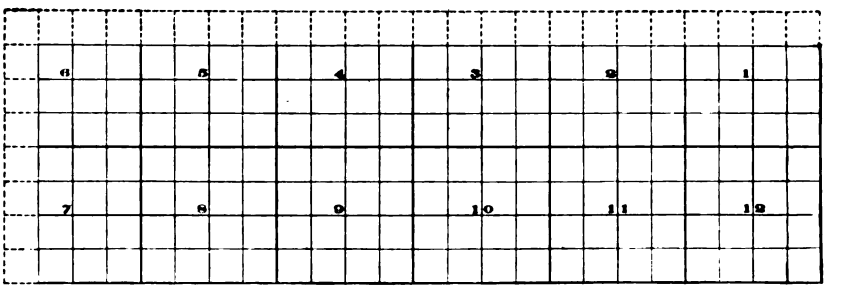
RECORD SHEETS

Statistical Diagrammatic Charts for Progress of Work.

No. 353-354.

				100 sheets.	Quire.
No. 353.	Engraving 7 × 12 in., on	drawing paper,	green only,	$4 75	$1 35
354.	" 7 × 12 " "	tracing "	orange "	4 75	1 35

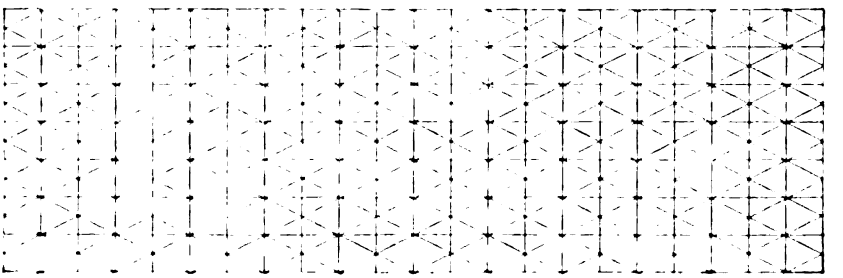
TOWNSHIP PAPER



			Quire.	Sheet.
No. 355.	Engraving 6×6 in., scale 1 in. to 1 mile,	black only,	$0 75	$0 05
356.	" 12×12 " " 2 " " 1 "	" "	1 50	10

ISOMETRIC SKETCHING PAPER

For making Drawings and Sketches in Isometric Perspective. Ruled.



No. 358A.

No. 358A.	Ruled in green, in	sheets 12 × 18 in., .	Per 40 sheets, $1 20
358B.	" " " "	pads of 40 sheets, 6 × 9 in., .	Each, 30
358C.	" " " " " "	40 " 9 ×12 " . "	60

For book on Practical Perspective, see No. 7541.

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RULED CROSS SECTION PAPERS

No. 360. In sheets, 16×21 in., ruled in blue, 10×10 to one inch. Per quire, $1 00

No. 362. In sheets, 16×21 in., ruled in blue, 8×8 to one inch. Per quire, $1 00

No. 364. In sheets, 16×21 in., ruled in blue, 5×5 to one inch. Per quire, $1 00

No. 366. Topographical Paper, 16×21 in., 400 feet to one inch, ruled in blue and red, ... Per quire, $1 00

The Ruled Cross Section Papers are not as reliable as the Printed Cross Section Papers.

Samples of Cross Section Papers mailed on application, or general Sample Book for 15 cents.

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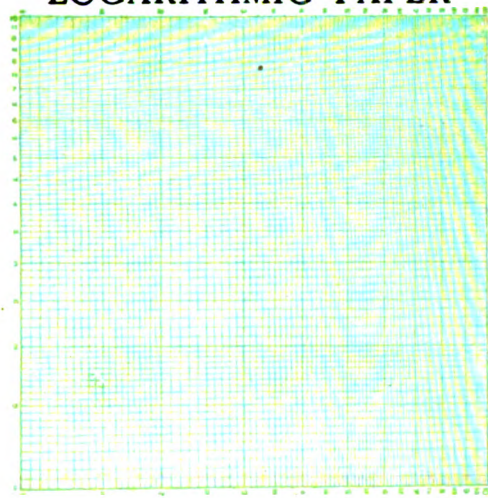
LOGARITHMIC PAPER



No. 366B.

		Per doz.
No. 366A.	Engraving 10 × 10 in., on tracing paper, green only, 5 in. base,	$0 75
366B.	" 10 × 10 " " " " " " 10 " "	75

Logarithmic Paper is so ruled that the scales in each direction are logarithmic instead of uniform, as on other cross section papers; the numbers and divisions marked are placed at such points as to make their distances from the origin proportional to the logarithm of such numbers instead of to the numbers themselves. By means of this paper logarithmic operations are performed graphically, without reference to the logarithms themselves. Many hydraulic and other engineering computations are facilitated by its use, and various relationships (sizes of tie-bars, shafts, etc., in terms of varying load, or the inverse; circumferences and diameters of circles in terms of their radii or diameters, or the inverse; weights of the series of bodies of the same substance and form but of varying size, or the inverse, etc., etc.,) can be represented.

CROSS SECTION BLOCKS

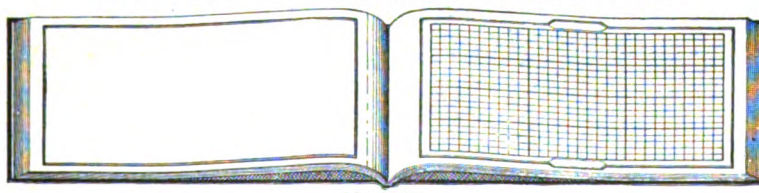
Of Printed Cross Section Paper.

		Each.
No. 367.	5 × 7 in., 10 × 10 to one inch, 24 sheets, printed in green,	$0 75
368.	5 × 7 " 8 × 8 " 24 " " "	75
369.	7 × 10 " 10 × 10 " 24 " " "	1 25
370.	7 × 10 " 8 × 8 " 24 " " "	1 25

Of Ruled Cross Section Paper.

No. 371.	8 × 10 in., 10 × 10 to one inch, ruled in blue, 24 sheets, .	$0 50
372.	8 × 10 " 8 × 8 " " 24 "	50

DUNHAM'S PLAT AND PROFILE BOOK



No. 379.

No. 379. Dunham's Plat and Profile Book, . . . Each, $1 00

This book is of thin, strong paper, bound in flexible morocco, 4½ x 9½ inches. It contains 28 profile pages, plate B, engraving 3½x7½ inches, printed in green, and has a blank page with margin opposite each profile page, for plats, etc. Some valuable tabels are also given in this book.

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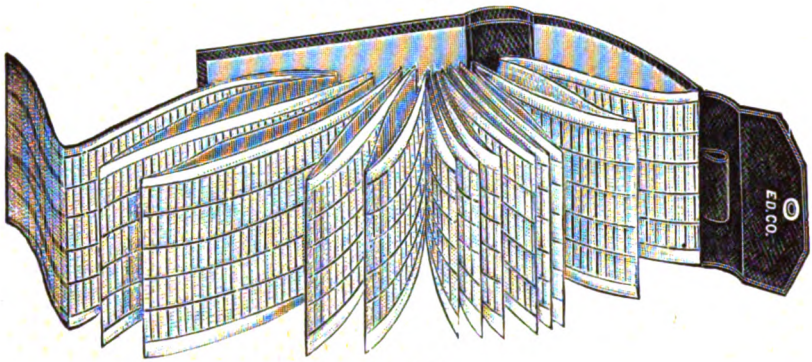
PROFILE BOOKS

CONTINUOUS.



No. 382.

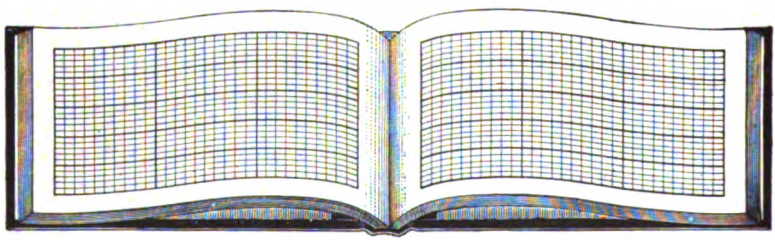
Bound in Flexible Morocco Covers.

These books are folded like a map to replace the continuous rolls of profile paper, and the pages are mounted on muslin.

Each leaf, or two pages facing, contain six thousand feet—a "Section" as generally laid out for the construction of a road. The paper lays smooth and is of extra fine quality.

No. 380.	Plate A.	4 × 20 to one inch.	5½ × 8 inches.	Printed in green.		
		12	25	50	100	miles.
		Each, $2 00	3 20	5 20	9 40	
No. 382.	Plate B.	4 × 30 to one inch.	4¾ × 8 inches.	Printed in green.		
		12	25	50	100	miles.
		Each, $2 00	3 20	5 20	9 40	

NOT CONTINUOUS.



No. 383½.

Stiff Morocco Covers.

No. 383.	Plate A.	4 × 20 to one inch.	Size of book, 7 × 10 inches.	Printed in green.	
			25	50	100 leaves.
		Bound in Morocco, . .	Each, $1 75	2 25	3 00
No. 383½.	Plate B.	4 × 30 to one inch.	Size of book, 5½ × 9½ inches.	Printed in green.	
			25	50	100 leaves.
		Bound in Morocco, . .	Each, $1 75	2 25	3 00

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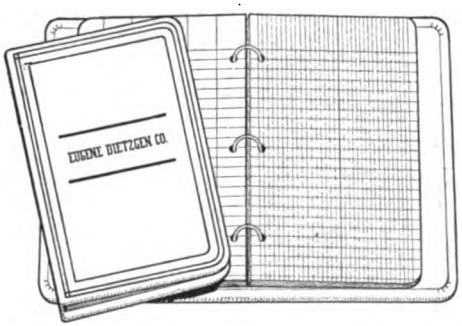
LOOSE LEAF ENGINEERS' FIELD BOOKS



No. 385A.

In response to a growing demand for our Engineers' Field Books in loose-leaf style, for certain purposes of engineering, we offer the following assortment. Books of this style are advantageous to Engineers who may wish to remove any leaves without disturbing the general arrangement of the notes. They also permit of leaving finished notes in the drafting room, while the books are still being used in the field.

The covers of our Loose-Leaf Books are stiff, with round corners, and bound in sheep skin. The mechanism is very light and strong, composed of a metal back with 3 rings, so arranged that they can be quickly opened with one operation, permitting the inserting or removing of the leaves. When the book is open the leaves lie perfectly flat, and as the covers are very stiff the book can be held firmly and the notes or sketches rapidly made. The leaves are of the same specially high-grade paper, with waterproof rulings, as furnished in our regular Engineers' Field Books, listed under Nos. 401, 404, 406 and 411.

No. 384A.	Loose-Leaf Field Book, complete with cover and 60 leaves of same size and ruling as furnished in our No. 401,	Each,	$2 15
384B.	Extra Loose Leaves for No. 384A, 60 leaves in set,	Per set,	35
385A.	Loose-Leaf Field Book, complete with cover and 60 leaves of same size and ruling as furnished in our No. 404, .	Each,	2 15
385B.	Extra Loose Leaves for No. 385A, 60 leaves in set,	Per set,	35
386A.	Loose-Leaf Transit Book, complete with cover and 60 leaves of same size and ruling as furnished in our No. 406,	Each,	2 15
386B.	Extra Loose Leaves for No 386A, 60 leaves in set,	Per set,	35
387A.	Loose-Leaf Level Book, complete with cover and 60 leaves of same size and ruling as furnished in our No. 411,	Each,	2 15
387B.	Extra Loose Leaves for No. 387A, 60 leaves in set,	Per set,	35
387E.	Muslin Eyelets, gummed, for reinforcing the holes of loose leaves, ...	Per 100,	15

For illustrations of rulings for the above books, see pages 54-57.

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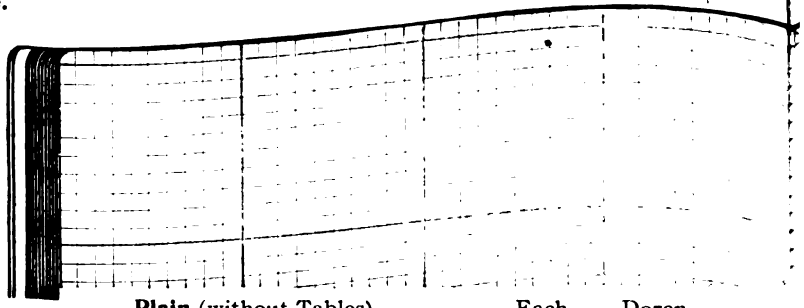
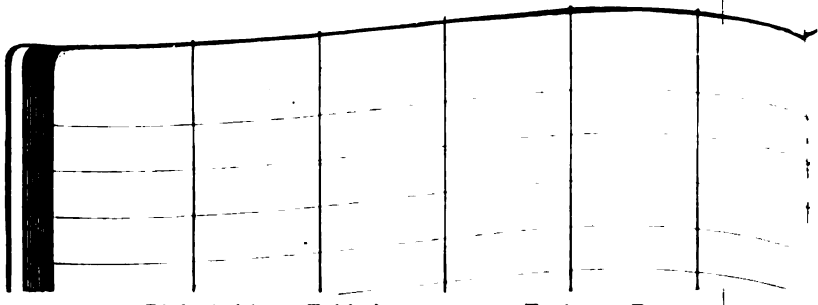
ENGINEERS'

The Engineers' Field Books manufactured by us are bound in sheepskin, of specially high quality with waterproof rulings. Any other style or size of **The Tables in our Field Books were calculated by F. E. Paradis, C. E., and con- decimals of a degree; Inches in decimals of a foot; Radii, Ordinates and Deflec- Curve Formulæ.**



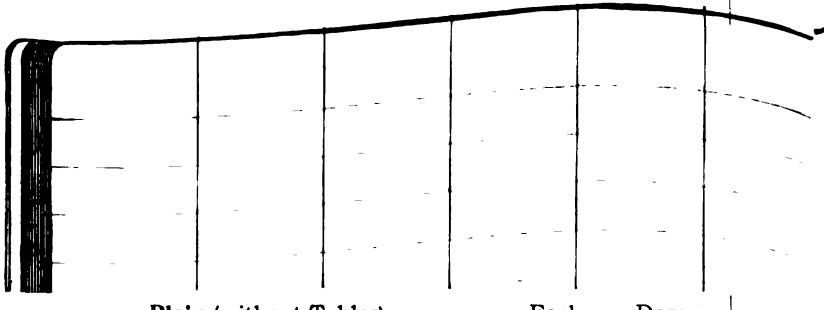
Plain (without Tables).

		Each.	Dozen.
No. 389.	Cross Section Book, 4½×7½ in., 80 leaves, ruled 10×10 to 1 in.,	$0 60	$6 00
390.	Cross Section Book, 5½×7½ in., 80 leaves, ruled 10×10 to 1 in.,	70	7 00
391.	Cross Section Book, 6½×8½ in., 80 leaves, ruled 10×10 to 1 in.,	90	9 00



Plain (without Tables).

		Each.	Dozen.
No. 400.	Field Book, 4½×7½ in., 80 leaves,	$0 55	$5 50
401.	" " 4¼×7 " 60 "	50	5 00



Plain (without Tables).

		Each.	Dozen.
No. 403.	Field Book, 4½×7½ in., 80 leaves,	$0 55	$5 50
404.	" " 4¼×7 " 60 "	50	5 00

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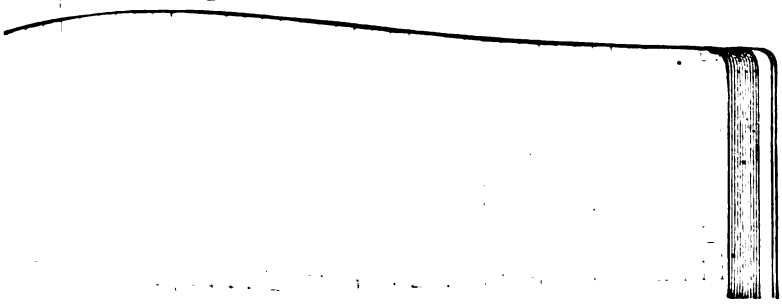
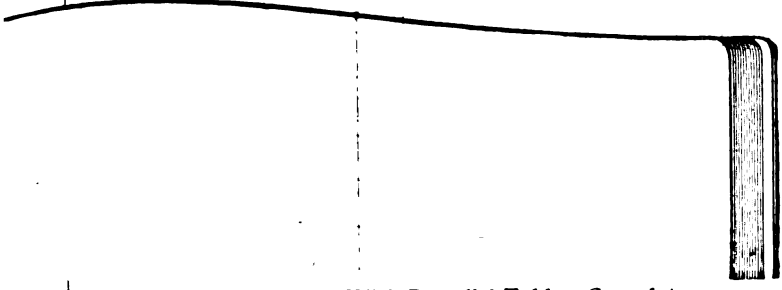
FIELD BOOKS

with round corners and round back so as to lie flat when open. The paper is Engineers' Field Books made to order in lots of not less than six dozen of a kind. **sist of the following: Tables for Excavations and Embankments; Minutes in tions; Tangents and Externals to a 1° curve; Middle Ordinates for Rails, and**



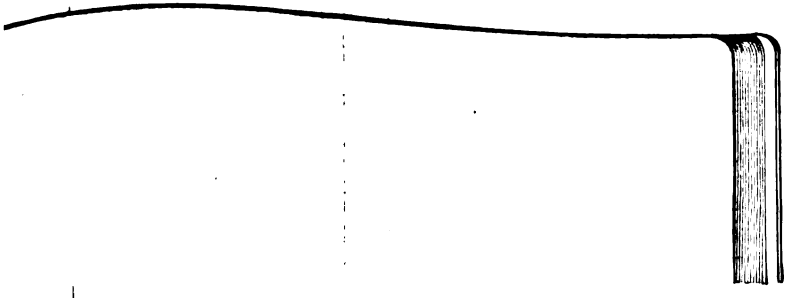
With Paradis' Tables for Excavations and Embankments.

		Each.	Dozen.
No. 389T	Cross Section Book, like No. 389, but with Tables,	$0 75	$7 50
390T.	" " " " " 390, " " "	85	8 50
391T.	" " " " " 391, " " "	1 05	10 50



With Paradis' Tables, Complete.

		Each.	Dozen.
No. 400T.	Field Book, like No. 400, but with Tables, . .	$0 65	$6 50
401T.	" " " " 401, " " " . .	55	5 50



With Paradis' Tables, Complete.

		Each.	Dozen.
No. 403T.	Field Book, like No. 403, but with Tables, . .	$0 65	$6 50
404T.	" " " " 404, " " " . .	55	5 50

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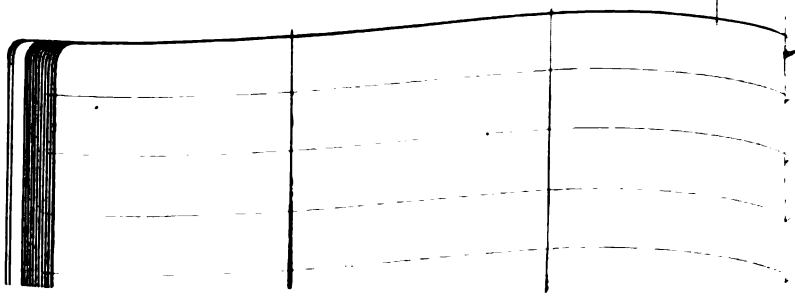
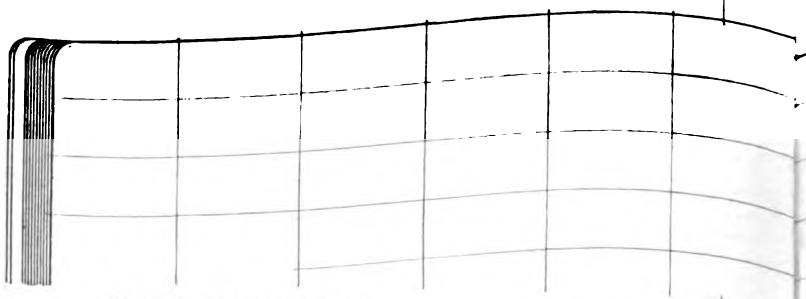


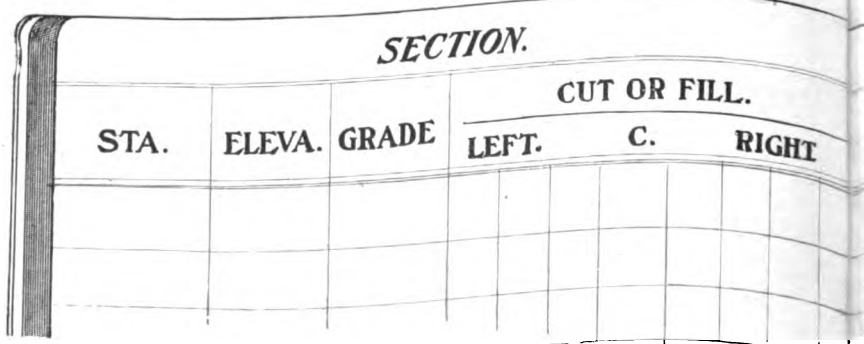
Plain (without Tables).

		Each.	Dozen.
No. 405.	Transit Book, $4\frac{1}{2}\times7\frac{1}{2}$ in., 80 leaves, ...	$0 55	$5 50
406.	" " $4\frac{1}{4}\times7$ " 60 "	50	5 00



Plain (without Tables).

		Each.	Dozen.
No. 410.	Level Book, $4\frac{1}{2}\times7\frac{1}{2}$ in., 80 leaves, ...	$0 50	$5 40
411.	" " $4\frac{1}{4}\times7$ " 60 "	45	4 50



No. 420. Field Book, $5\frac{1}{4}\times8$ in., 80 leaves, printed headings, plain (without
420T. " " $5\frac{1}{4}\times8$ " 80 " " " with Paradis'

For Loose-Leaf Engineers' Field

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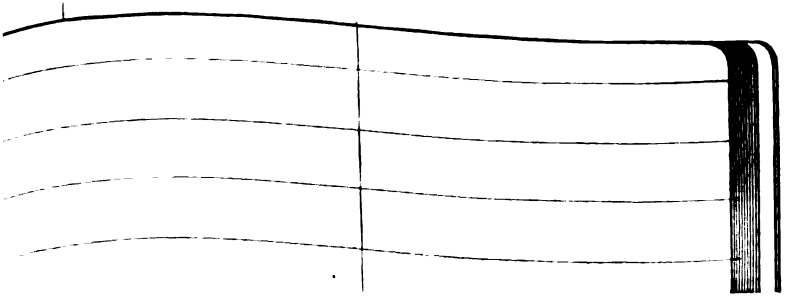
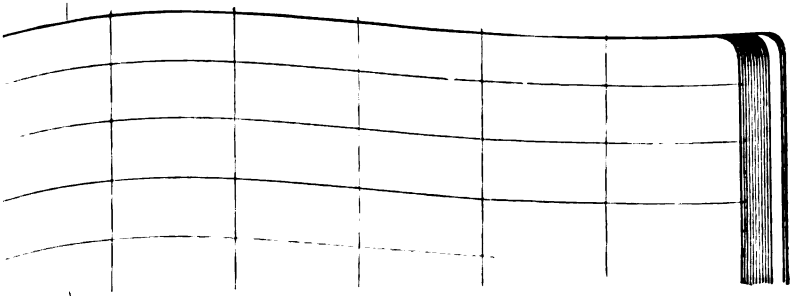
FIELD BOOKS



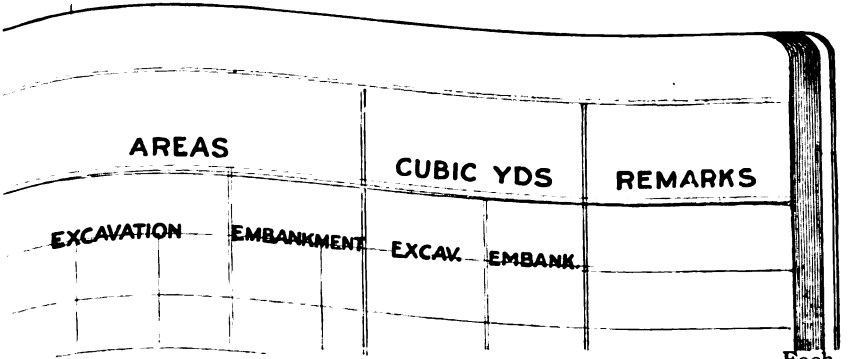
With Paradis' Tables, Complete.

		Each.	Dozen.
No. 405T.	Transit Book, like No. 405, but with Tables,	$0 65	$6 50
406T.	" " " " 406, " " "	55	5 50



With Paradis' Tables for Excavations and Embankments.

		Each.	Dozen.
No. 410T.	Level Book, like No. 410, but with Tables,	$0 60	$6 00
411T.	" " " " 411, " " "	50	5 00



	Each.	Dozen.
Tables),	$0 85	$8 50
Tables, complete,	95	9 50

Books, see Nos. 384A-387E.

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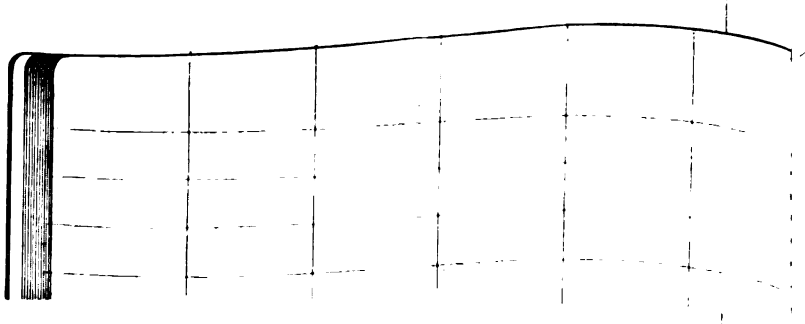
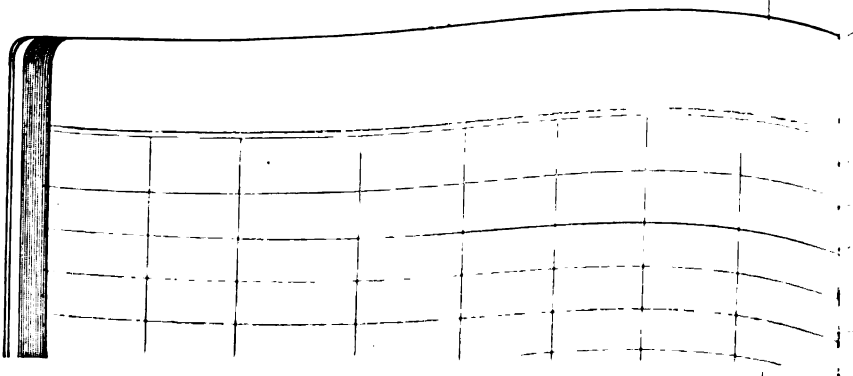
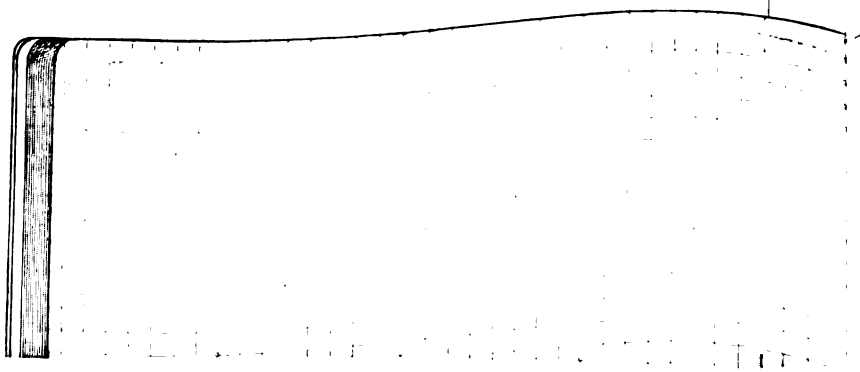


No. 422. Mining Transit Book, 4½×7½ in., 80 leaves, right-hand page 8×8 to valuable Tables. . . . . .



No. 424. Topographical Book, 5×8 in., 80 leaves, plain (without Tables),



No. 426. Cross Section Book, 6½×8½ in., 80 leaves, plain (without Tables)

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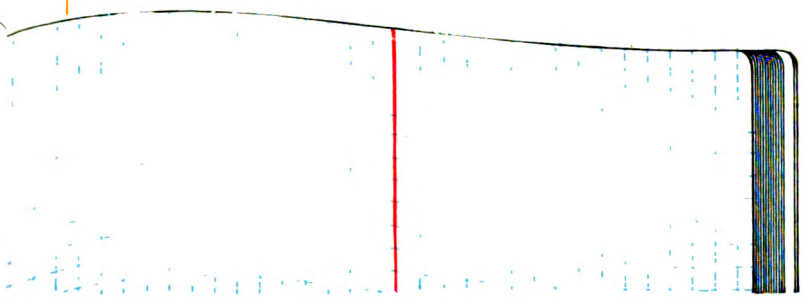
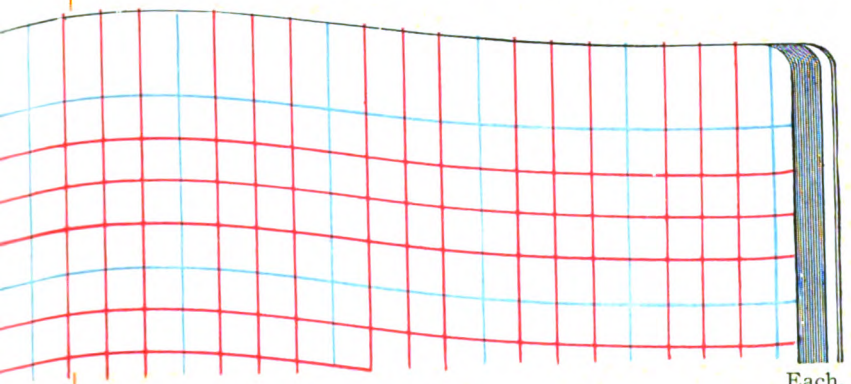
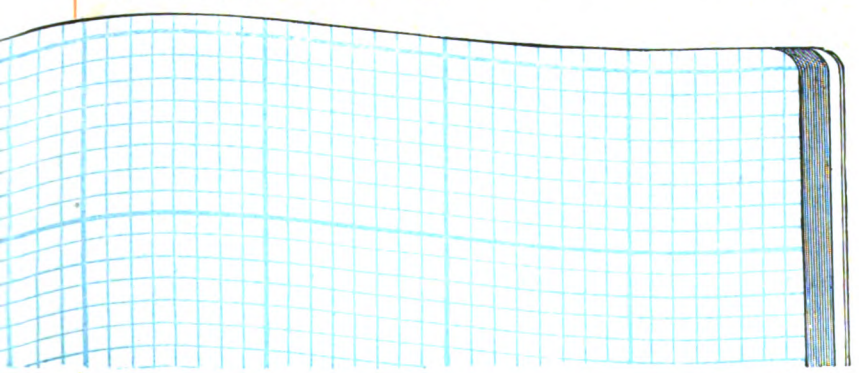
FIELD BOOKS



	Each.	Dozen.
1 inch, with Natural Trigonometrical Functions and other	$0 65	$ 6 50



	Each.	Dozen.
right-hand page 4×4 to 1 inch, ...	$1 20	$12 00



	Each.	Dozen.
ruled 8×8 to 1 inch, ...	$0 90	$ 9 00

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"STANDARD"

BLANKS FOR THE BUILDING TRADES

BLANK FORM SPECIFICATIONS AND REMINDER.

For Frame and Brick Buildings, costing from $500 to $10,000.

We call attention to our new and revised blank forms of **Specifications and Contracts** and other forms, which have been added to our list, and especially to the revision of the Plumbers' Specification Blank, which has been entirely rewritten, and the addition of the Heating and Electric Wiring Specification Blanks which the present requirements demand in the up-to-date building. A thorough revision of the other blank forms of the Specifications, Contracts, Bonds, etc., has been made, so as to meet the requirements of the advanced ideas of the building laws and the new revised State lien laws.

THE "STANDARD" BLANK FORMS OF SPECIFICATIONS consist of 17 different specifications, furnished on 14 sheets. In strong manilla cover, containing the following blank forms:

PREAMBLE,	PLUMBERS',	IRON (Structural),	AGREEMENT between Owner and Contractor (with Bond).
MASONS',	PAINTERS',	HEATING, Steam or Hot Water,	
CUT STONE,	GLAZIERS',	HEATING, Furnace,	
PLASTERERS',	GASFITTERS'	ELECTRIC WIRING,	CONTRACTORS' STATEMENT.
CARPENTERS',	SEWERS, GALVANIZED IRON.		

Besides the above mentioned forms, attention is called to the useful **"Architects' Reminder"** printed on inside of cover.

No. 430. **"Standard" Specifications.**
Single sets, . $0 25; Dozen sets, $2 50; 100 sets, $17 50

433. **Printed Covers** for specifications, plain, ... Per doz., 35; Per 100, 2 50

436. **Building Contracts,** . . . " 20; " 1 25

436½. **Building Contracts,** with bond, " 25; " 1 75

437S. **"Uniform" Building Contracts,** singular, Per doz., 25; " 1 75

437P. **"Uniform" Building Contracts,** plural, " 25; " 1 75

438A. **Contractors' Statements,** . . . . " 25; " 1 75

438B. **Mechanics' Lien Notice,** . . . . " 25; " 1 75

438C. **Waiver of Lien,** . . . . . " 25; " 1 75

440. **Architects' Certificate Books.** Cloth bound. Per book of 100 blanks on good quality bond paper, ... Each, 60

441. **Architects' Certificate Books.** 100 blanks. Ordinary paper, ... " 40

TYPEWRITER PAPERS FOR SPECIFICATIONS, ETC.

No. 460. **Onion Skin Bond,** white, 8½x13 in., per ream of 500 sheets, in box, $1 75

462. **Standard Bond,** thin, 8½x13 in., per ream of 500 sheets, in box, 1 45

464. **Standard Bond,** medium, 8½x13 in., per ream of 500 sheets, in box, 1 70

SUNDRIES

No. 470. **Black Oil Cloth,** for covers for drawings, 48 in. wide. Per yard, $0 45

471. **Green Oil Cloth,** " " " " 48 " " " 45

475. **Legal Cap Paper,** Per quire, $0 30; Per ¼ ream, $2 25; Per ream, 4 00

480. **Gelatine or Glass Paper,** in sheets 15¾×23¾ in., medium thick, ... Per sheet, 25

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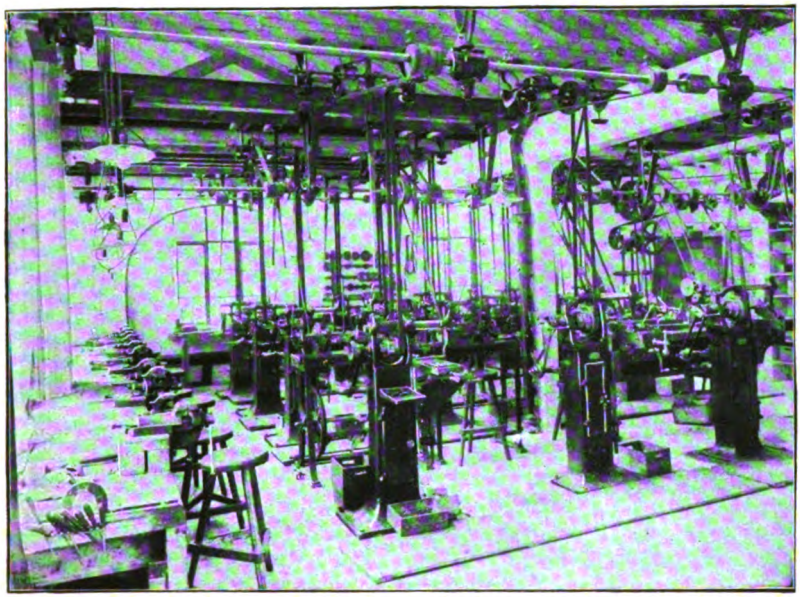
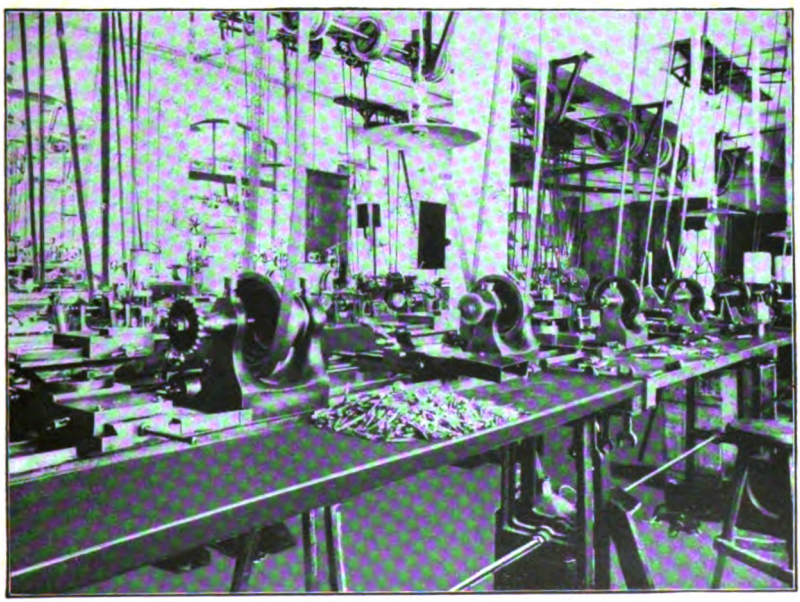


INTERIOR VIEWS OF OUR DRAWING INSTRUMENT FACTORY.



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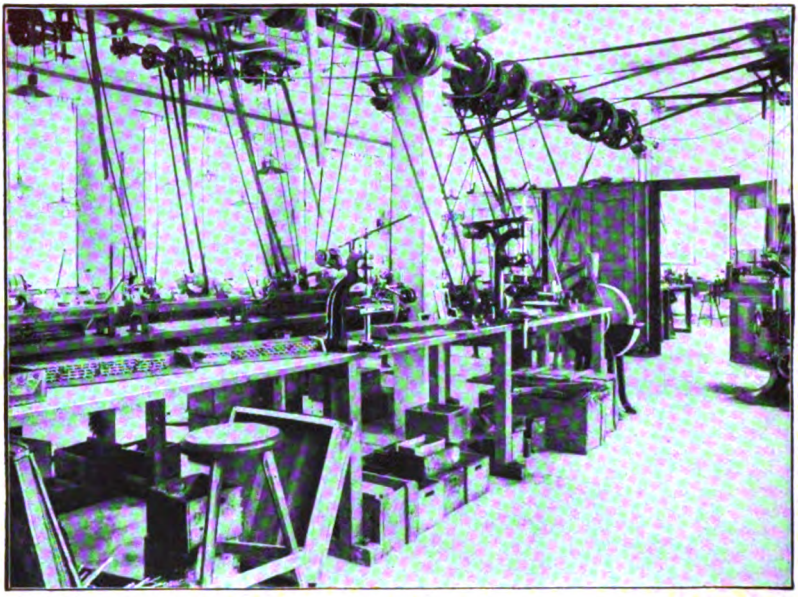
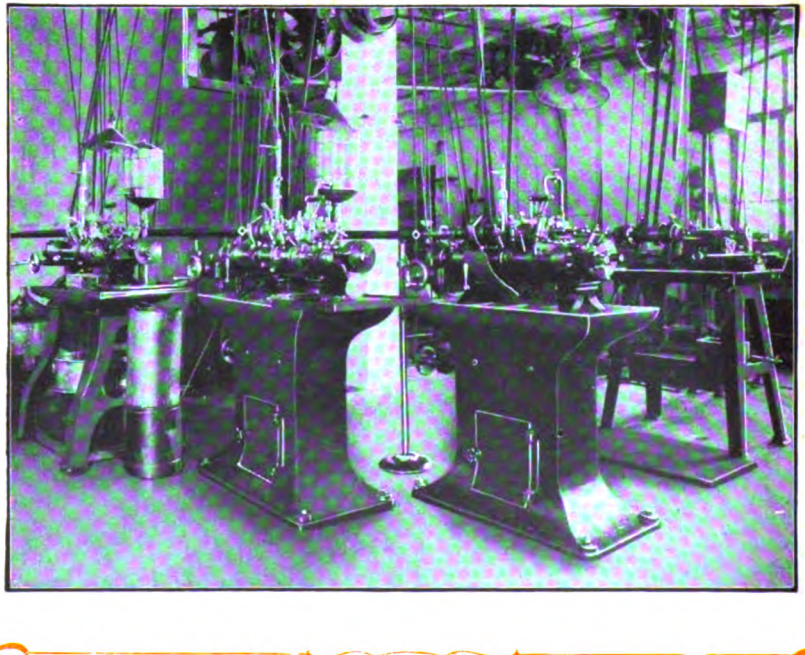


INTERIOR VIEWS OF OUR DRAWING INSTRUMENT FACTORY.



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SUGGESTIONS FOR SELECTING
DRAWING INSTRUMENTS

The selection of Drawing Instruments, in view of many varieties of questionable makes with which the market today is flooded, should be carefully considered by the prospective purchaser. A proper choice, moreover, on the part of our patrons, of the grades of tools they may need, is quite as desirable to us as to them. For the benefit of any who are located where they cannot personally inspect the special instruments they might want, we deem it expedient to make sufficient explanation of the various grades manufactured by us, to enable our patrons to make a satisfactory selection.

We manufacture the following grades of Drawing Instruments, for varied requirements: **"GEM UNION," "EXCELLO" INSTRUMENTS OF PRECISION, "PREMIER," "SUPERIOR," "FEDERAL," "UNIVERSAL," "RELIANCE"** and **"SCHOLAR"** brands. As the profession is usually interested in the higher grades only—realizing that, in the long run, first grade tools are really cheaper than lower priced ones—we shall pay special attention to our higher grades.

OUR MANUFACTURING FACILITIES

By way of preface to a description of the above grades, we wish to call particular attention to our exceptional manufacturing facilities which we have developed to meet the constantly growing demand for our instruments. Our Drawing Instrument Factory is thoroughly modern. It is equipped with the most improved machinery, which, combined with expert workmanship and supervision, enables us to produce instruments universally recognized as the standards of excellence. By making our own instruments, instead of depending upon other manufacturers, we have the *unusual* advantage of maintaining the uniformity and high qualities for which our instruments are noted. Furthermore, we are in a position to produce, in each grade, tools possessing the very best material and workmanship obtainable at the respective prices. Those possessing our instruments can obtain, at any time, accurately fitting parts at reasonable prices to replace any parts lost or broken.

HIGHEST GRADE INSTRUMENTS

For those desiring highest grade instruments, we offer our well known **"GEM UNION"** brand and our **"EXCELLO" Instruments of Precision,** which can be obtained only from us or from dealers handling our goods.

The remarkable success our **"EXCELLO" Instruments of Precision** have met with, since first introduced by us, and the numerous testimonials we have received, show us that the many unique features of these instruments have satisfied a long felt want among professional draftsmen.

Our **"GEM UNION" Instruments** are too well known to require any introduction, and the "Pivot joint Compasses with the bolt running all the way through" is a familiar phrase to draftsmen, most of whom have heard salesmen for competing houses *try* to explain (but with indifferent success) why Compasses of similar appearance, but not possessing this feature, could be just as good.

It is difficult to establish any comparison between the **"GEM UNION"** and **"EXCELLO" Instruments**, as they differ so radically in construction, and each line possesses features absolutely unique to itself. Each may, however, be considered perfect along its own lines, and the matter of selection between them must be left to the taste of the purchaser, who cannot make a mistake in choosing either, as both bear our unqualified guarantee.

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GEM UNION INSTRUMENTS

Since we first put our Gem Union brand of instruments upon the American market, we have maintained for them the highest degree of perfection, and by embodying in their construction such points as the experience of the most skillful draftsmen of America and Europe have found valuable, we believe that the "Gem Union" instruments, as now constructed, are mechanically superior to any other "American Pattern" of instruments.

Regarding excellence of material we claim no monopoly, and do not adopt the tactics of some of our competitors, who try to belittle any instrument not handled by them. On the contrary, we willingly concede the excellence of *material* of several of the high-grade brands; and while the material of which our "Gem Union" instruments are constructed is as good as money and skill can produce, we lay special stress upon the *mechanical features* of the instruments—notably the **"Union Pivot Joint," "Screw Thread Needle Point," "Improved Shank and Clamp Socket," "Clamping Device"** and **"Slide-Catch Device"** for cleaning pens, each of which points will be explained in detail.

MATERIAL

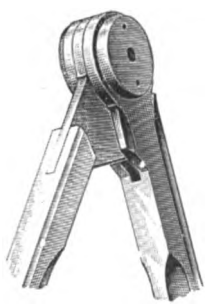
The materials used by us in the manufacture of **"Gem Union" Instruments** are the best and most desirable quality obtainable. These instruments are cut (not cast or coined in die) from the most select grade of cold rolled German silver, to afford greatest efficiency in combining strength, density, elasticity and lightness. Comparative and thorough tests have demonstrated that the German silver thus employed in these tools withstands a greater strain than the German silver extensively used in other makes of drawing instruments. It is due to the superior quality of our German silver that we produce instruments so universally known for lightness combined with unexcelled strength and rigidity. The steel parts are of the highest grade English tool steel, correctly tempered.

FINISH

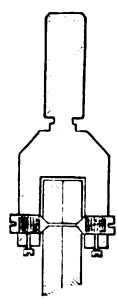
The finish of our "Gem Union" instruments is remarkably fine, and so bright that the least flaw or fault in workmanship, form or quality of material could be easily detected.

GEM UNION COMPASSES

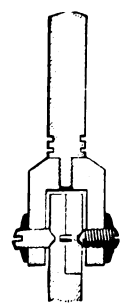
The drawing instruments most used are Compasses and Dividers (in various styles) and Ruling Pens. We shall therefore give a brief description of each.



Tongue joint.



Ordinary Pivot joint.



Ordinary Pivot joint with lock nuts.

Union Pivot joint

The most important part of a pair of compasses, and the part which in poor instruments will give the most trouble, is the head, formed by the joint.

There are various styles of joints, the tongue and pivot joints being most generally used.

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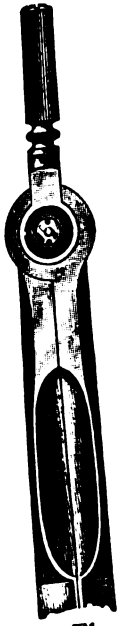
GEM UNION INSTRUMENTS

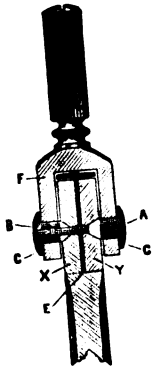
Continued

Owing to the fact that with the pivot joint any wear on the pivots can be compensated by simply tightening, while the construction of the tongue joint permits of no provision for taking up the lost motion caused by wear, the latter joint has long since been abandoned (for all but the cheaper grade of tools) by all up-to-date progressive instrument houses.

It is therefore generally recognized that the pivot joint is much more desirable, and any defects it may possess in its ordinary form are overcome in our improved forms.

THE UNION PIVOT JOINT





As will be noted by illustration above, the steel bolt or screw "A" passes through the entire head and fits into screw "B."

The conical-shaped parts of "A" and "B" form the pivot points which are securely held by lock nuts "C" and "C." The figure "E" indicates a steel disc that acts as an anti-friction bearing for heads of compass legs "X" and "Y."

The advantages of the "Union" joint are, as will be readily seen, of the highest importance.

1. The weight of the fork "F" is minimized, as the bolt "A-B" goes entirely through the legs and bolts the forks together, thus making the heavy and clumsy forks required by the usual style pivot joint unneccessary.
2. The danger (ever present in the usual style instrument) of spreading and possibly breaking the arms of the fork if too much tension is applied to the pivots, is entirely eliminated by the screw bolt "A-B."
3. Adjustment can be rapidly made, because to apply tension only one of the lock nuts must be loosened.
4. The large bearing surfaces of the joint greatly increase its durability.
5. It is impossible to spring the legs of compass out of position by accidents, such as dropping, etc.
6. The construction of the joint gives the instrument a neat, clean and graceful appearance.

The **Straightening Device** "G-G," as applied to some of our Gem Union compasses and dividers, is a simple and useful attachment for holding the handle in a perpendicular position at all times, irrespective of the spread of the legs "X-Y."

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GEM UNION INSTRUMENTS *Continued*

SCREW-THREAD NEEDLE POINT

Patented Dec. 26, 1899.

The screw-thread needle point possesses the obvious advantages of quick, minute and positive adjustment.

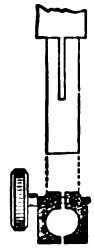
The portion "A" is threaded in the extremity of the leg.

The portion "B" is knurled, to be more easily turned with the fingers.

The thumb-screw "C" clamps the needle point rigidly.

We have adopted screw-thread needle points for all our better grade instruments, bow pencils and bow pens included.

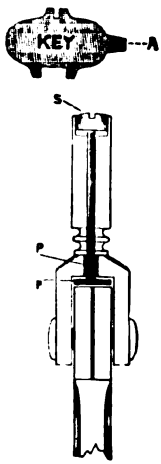
SHANK AND CLAMP SOCKET



In the round form the feathered shanks fit into side clamping spring sockets. By this construction the interchangeable parts of the compass are locked firmly twice. First, by the steel feather of the shank, and secondly, by clamping sockets drawn together with screw.

In the pentagonal form, the shank is held in socket by means of a screw. The sharp corners of the shank may wear, in which case the pressure of the set screw is not enough to hold the shank rigid. For this reason the pentagonal shank is less satisfactory for the highest grade instruments. In our Gem Union instruments the shanks of all interchangeable parts are made in the round feathered shape.

CLAMPING DEVICE



By a turn with key "A" the screw "S" presses down on pin "P" which is fastened to the small plate "P." This plate "P" is resting on the top of compass legs, and being pressed down upon them holds the Divider or Compass points safely in any position.

Owing to the strength given to our Union joint by the steel bolt connecting the pivots, no harm can be done to the joint by the clamping device, such as is likely to happen with any other pivot joint.

The further advantage of our clamping device over others in the market is that the handle remains perfectly rigid and that there is no screw on top or other impediment to the free and safe handling of the instrument.

The device is very valuable for spacing the same distances or for using the same opening of compasses repeatedly and accurately.

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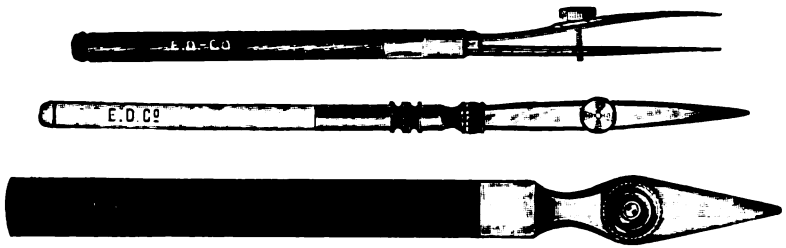
GEM UNION INSTRUMENTS *Continued*

GEM UNION RULING PENS



The Ruling Pen is, if not the most important instrument, at least the one which is in most constant use, and we therefore spare no efforts to make our pens as nearly perfect as possible. The tool steel used is tempered to a degree of hardness which allows pens to hold their points for a long time, and the pens being properly sharpened, perfect alignment of the nibs against the paper is assured.

The pen without joint is now most generally used, and as most draftsmen are somewhat careless about cleaning their pens frequently, we have placed upon the market our "Improved Slide-Catch Pen" described and listed under Nos. 510-512. This pen can be cleaned or sharpened without changing the adjustment for width of lines.

Few draftsmen appreciate the importance of thoroughly cleaning their pens before laying them aside. Most drawing inks corrode steel, and a fine pen may be quickly ruined by carelessness in this respect. The "Slide-Catch Pen" is therefore especially valuable, as the cleaning operation can be performed with a minimum of trouble.

GEM UNION BOW INSTRUMENTS

Steel Spring Bow Instruments, as auxiliaries to the ordinary compasses and dividers, are very popular for drawing the smaller circles. They are made of one continuous piece of steel, carefully tempered and finished. The screws and handles are of German silver. All threads are made with extreme care and uniformity. The Bow Pencils and Bow Pens have our patent screw-thread needle points, with micrometer adjustment.

GUARANTEE

Each Gem Union Instrument is guaranteed to satisfactorily perform the work for which it is intended, and to be absolutely perfect in every respect.

Every Gem Union Instrument bears our monogram, of which the following illustration is a fac-simile:

Besides this monogram, we stamp all compasses, dividers, bow instruments and ruling pens with their quality mark, **"Gem Union."**

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EXCELLO INSTRUMENTS OF PRECISION

The **"Excello" Instruments of Precision** are rapidly gaining the high position to which their excellence of material and workmanship, as well as their many desirable and unique features, entitles them. They are made of the same perfect quality of materials as employed in the Gem Union brand, and should not be confounded with other makes which may resemble ours in *appearance*, but which are invariably of greatly inferior quality and workmanship. These instruments embody all the latest improvements which our experience with this type has suggested.

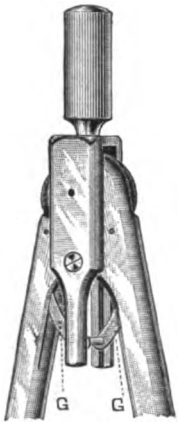
Some of the innovations in style may at first glance seem startling to the American eye, but when same are examined point by point, each feature will be found to be admirably adapted to the purpose for which it was devised, and the simplicity and effectiveness of the various points will win the user's admiration, and most likely gain a staunch friend for the **"Excello"** instruments.

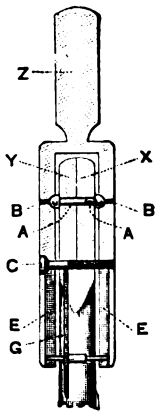
EXCELLO COMPASSES AND DIVIDERS

The most important requirement in Compasses and Dividers intended for high-class work is an absolutely true and steady joint, and no matter how excellent the material and workmanship of the instrument may be, it is useless unless the joint is mechanically perfect.

The "Excello" joint fulfills these conditions, and its mechanical working is perfect. It can never become loose or work imperfectly; it permits of easy, rapid and exact adjustment, and can readily be oiled if desired.

THE EXCELLO JOINT





As will be noted by illustrations above, the joint is constructed by two concentric pivots, "A-A," having an oval head at each end; these heads rest in the recesses "B-B" drilled on the inner surface of the fork "E-E" to receive the pivots. The adjustment of the joint is simply and effectively regulated by the screw "C," which can be tightened or loosened at will, and by means of which any wear in the joint can be effectually compensated.

It will thus be seen that the tension can be *readily and minutely regulated*, and that even and uniform action of the joint is not dependent on the transient elasticity of the fork, but is assured by the permanent pressure exerted by screw "C." The principles employed in the construction of the joint insure smooth motion during the entire life of the instrument.

The **"Straightening Device,"** "G–G," a feature by means of which the handle "Z" is always held perpendicular to the drawing surface, irrespective of the spread of the legs, "X–Y," is an especially valuable attachment to the **"Excello"** Compasses and Dividers, and will be appreciated by all who use Drawing Instruments. The simplicity of this feature will be noted by reference to the illustrations.

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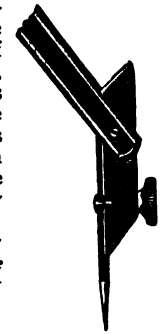
EXCELLO INSTRUMENTS OF PRECISION *Continued*

GENERAL FORM

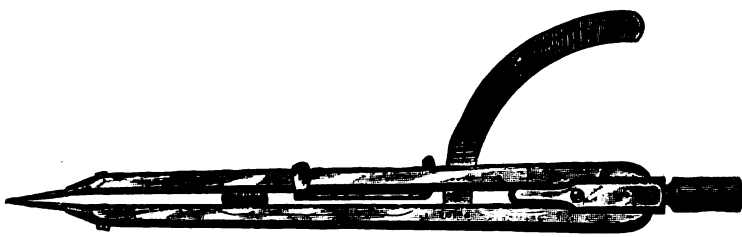
The legs of all Compasses and Dividers are shaped as shown in cross sectional cut herewith, and have *no sharp edges or corners.* The "Excello" Instruments are therefore more pleasant to handle than those of the usual style. The unique form, coupled with the easy motion of the joint, enables users to easily spread the legs and make minute and accurate adjustments with one hand.

Pen, pencil and needle parts are securely held in their sockets by clamps of the **"T Bolt" pattern.** The principle of the socket is very simple, but effective, and as all spindles and nuts are interchangeable, parts can be interchanged, or lost parts can be replaced without trouble and but little if any expense. The possibility of stripping threads is thus almost entirely eliminated and a tight joint is insured.

The fixed needle point leg is provided with our screw-thread needle point held in a threaded sleeve, which permits of quick and easy adjustment without the loosening of any clamp screws. On account of the screw thread, the slipping of the needle point, so annoying a feature in most other instruments not of our make, is entirely eliminated. The sleeve can be turned to a perpendicular position, and as it is at the end of the leg, circles of greater radii can be drawn with the "Excello" compasses than with any other style. This needle is reversed from its plain point to its shouldered end by loosening the nut of T bolt.



All Compasses have an *extra needle point leg,* so that they can be used as dividers, and the needle for same is *adjustable and reversible.* In case of damage to both points, only a new needle point is required.



The **Self Clamping Compasses and Dividers** will be found valuable for fine work of any description, but especially when the same opening (adjustment) of legs is used a number of times. The legs are automatically held absolutely rigid at any point, and to change the adjustment it is merely necessary to press on a small spring on the outside of compass legs, when the pressure is released and the legs move as freely as those of the plain compasses.

The *steel points* on all Dividers are *adjustable and reversible,* and in case of damage to both points, a new point can be quickly substituted without trouble.

All sets contain at least one **Metal Handle** holding *reserve needle points.*

This Handle fits the pen, pencil and needle parts, any one of which can, in connection with the handle, be used as a separate instrument.

All Parts of Excello Instruments are interchangeable.

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EXCELLO INSTRUMENTS OF PRECISION *Continued*

The **Center Tack** which is furnished with each large set is of advantage when concentric circles are drawn, as the enlarging of the center hole in paper is overcome. The center tack has a very fine point, and the top of tack is hollowed to receive point of instrument.

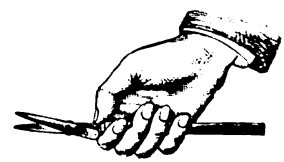
We call special attention to the fine (sharp) points of needles. This is especially valuable for accurate spacing, and at the same time possesses the advantage of not marking the drawing with large holes.

EXCELLO RULING PENS

All Pens are made extremely hard, and hold their points under severe usage extraordinarily well. Pens Nos. 725, 726 and 727 are made solid, and owing

to the **"T Bolt"** construction any possibility of lateral motion of the blades is entirely overcome, the pressure of the screw being direct and positive.

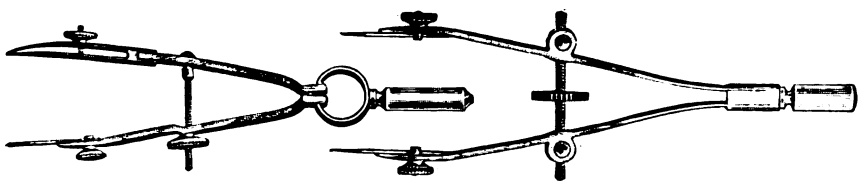
Ruling Pens Nos. 728, 729 and 730 are of the **"Cross Joint" pattern,** and the advantage of the design (which permits of the opening of pen for cleaning or sharpening without destroying the adjustment for width of line) will be greatly appreciated by draftsmen. This feature has also been applied to pen parts of compasses.



The other styles of Excello pens we catalogue are all made as carefully as those mentioned above, and of the same high grade of material. The designs will be found unique and useful.

EXCELLO BOW INSTRUMENTS

These tools are very popular for smaller circles, and the large size Excello Bow Instruments have such a great spread that they can frequently be used in place of regular size compasses. We carry both the **"side wheel"** and



"center wheel" styles, and a choice between the two depends upon individual taste. The two styles are made in the **ordinary spring** construction, and the **circular spring** construction.

The ordinary spring construction instruments are, with the exception of handles and screws, made of steel, while in the circular spring construction only the circular spring is made of steel. The latter style of construction possesses some advantages owing to the *absolutely even tension at any adjustment.*

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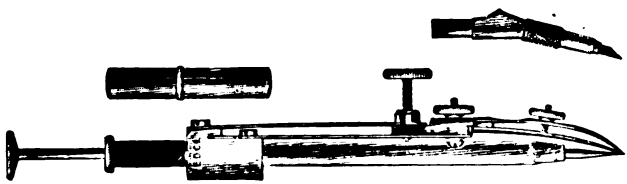
EXCELLO INSTRUMENTS OF PRECISION *Continued*

In all "center wheel" Bows the center screws are milled to a millimeter graduation, and can be used for millimeter spacing. The needle points on all bow instruments are *adjustable and reversible*, and can be quickly replaced in case of damage.

We call special attention to the Excello Drop Spring Bow Pen Nos. 760 and 761.



Owing to the construction of this Instrument, the pen or pencil point is always perpendicular to the drawing paper *at any adjustment*, while other drop spring bows are perpendicular *at only one point*. The improved construction also gives it greater rigidity than similar instruments possess, and the increased weight at the proper point makes its use much easier than that of similar instruments. The circles drawn are all clean-cut and clear, ovals and shaded circles being entirely done away with.

GUARANTEE

Each "Excello" Instrument is guaranteed to satisfactorily perform the work for which it is intended, and to be absolutely perfect in every respect.

Every "Excello" Instrument bears our monogram (E).

Besides this monogram, we stamp all compasses, dividers, bow instruments and ruling pens with their quality mark, **"Excello."**

HIGH GRADE INSTRUMENTS

PREMIER BRAND

Our **"PREMIER" Instruments** rank next in quality to the Gem Union and Excello brands, and will be found superior in many respects to other makes offered as "finest grade and highest quality." We make these instruments of high-grade rolled German silver and tool steel, carefully finished. The heads of compasses and dividers have pivot joints with steel lock nuts. Compasses and bow instruments are fitted with our patent screw-thread needle points. Our improved Straightening Device is fitted to handles of all compasses and dividers. All the ruling pens possess our patent "slide-catch" cleaning device.

We guarantee these instruments to be high grade, and to satisfactorily perform the work for which they are intended. Every Premier Instrument bears our monogram (E).

Besides this monogram, we stamp all compasses, dividers, bow instruments and ruling pens, with their quality mark (A).

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OTHER GRADES OF INSTRUMENTS

SUPERIOR BRAND

Our **"SUPERIOR" Instruments** are among the best German silver instruments made, and rank next in quality to the "Premier" grade. They are carefully constructed of rolled German silver and steel. They compare favorably with many so-called "high-grade" instruments, and should not be confounded with makes of similar *appearance*, but of much inferior quality. Compasses and bow instruments are fitted with our screw-thread needle points. We warrant these instruments to satisfactorily perform the work for which they are intended. Each instrument is stamped with our monogram (E).

Besides this monogram, we stamp all compasses, dividers, bow instruments and ruling pens with their quality mark (S).

FEDERAL BRAND

The **"FEDERAL" Instruments** are of rolled German silver and steel, substantially constructed and properly finished. They are warranted to render satisfactory service for a reasonable length of time. Compasses and bow instruments are fitted with handles and with our screw-thread needle points. Each instrument is stamped with its quality mark [F].

UNIVERSAL BRAND

The **"UNIVERSAL" Instruments** are similar in shape to our Excello type, and are of good German silver, with steel needle points. They are especially adapted for Manual Training School use, and possess remarkably satisfactory qualities. All dividers and compasses have handles. All compasses, dividers, bow instruments and ruling pens are stamped with their quality mark <U>.

RELIANCE BRAND

The **"RELIANCE" Instruments** are of German silver and steel. These also are well adapted for Manual Training School use. They are improved in quality and appearance, and will render good service for a reasonable time. All dividers and compasses have handles and are furnished in two styles of head joints: pivot joint and round joint. This grade should not be confused with other makes which are cast and somewhat similar in *price and appearance*, but very inferior in quality.

SCHOLAR BRAND

The **"SCHOLAR" Instruments** are of German silver and recommend themselves mainly on account of their low prices. These instruments are very superior to the usual brass or nickel-plated tools on the market at similar prices.

All our Drawing Instruments are manufactured and distributed solely by us. They can be procured from us direct, or from dealers handling our goods in most cities of the United States, Canada, Mexico, and other countries.

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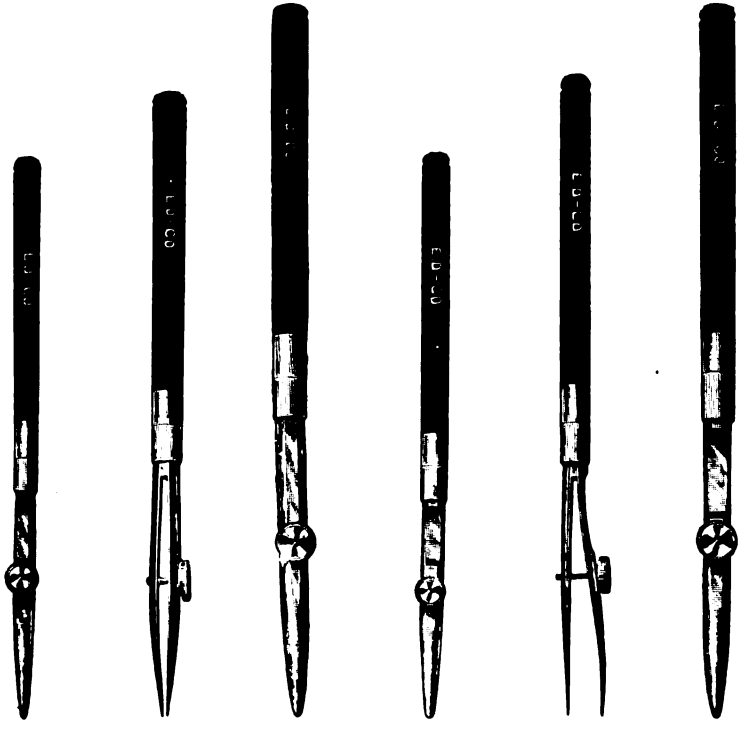
GEM UNION INSTRUMENTS

The Highest Grade of Instruments.

Of Cold Rolled German Silver and Best English Tool Steel.
Each Instrument stamped ⓔ and **Gem Union.**

For description, see pages 63-67.

Illustrations ⅔ size.



No. 500. 501. 502. 506. 507. 508.

No. 500.	Ruling Pen, 4¼ in., ebony handle, ...	Each,	$0 90
501.	" " 5 " " "	"	1 00
502.	" " 5½ " " "	"	1 20
506.	" " 4¼ " " " upper blade with spring,	"	1 10
507.	" " 5 " " " " " "	"	1 20
508.	" " 5½ " " " " " "	"	1 35

If desired we furnish aluminum handles in place of ebony handles for Nos. 506 to 508, at 15 cents each additional.

Pens carefully dressed and sharpened, 20 to 25 cents.

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GEM UNION INSTRUMENTS

Highest Grade

THE SLIDE-CATCH RULING PEN.

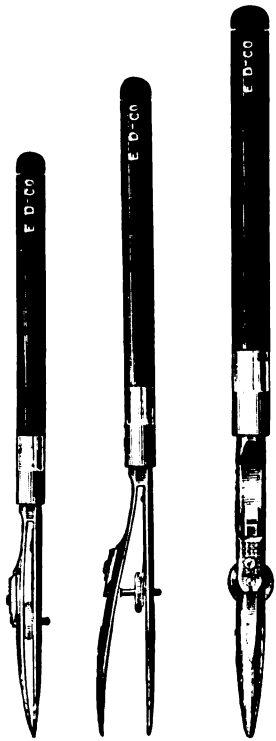
Patented April 17, 1900.

Each Instrument stamped (E) and **Gem Union.**

Illustrations ⅔ size.

This Ruling Pen is so constructed that by the simple operation of moving a slide the blades may be instantly thrown open, cleaned or sharpened, and closed again to their former position without interfering with the set screw, thus preserving the adjustment for width of lines.

The Pen is made of one piece of finely tempered steel, with the upper blado in the form of a spring, so constructed that its elasticity tends to raise it from the lower blade a distance sufficient to permit of thorough cleaning. The Slide-Catch on the upper blade engages the slot-head of spindle, which latter also constitutes a center wheel adjusting screw, the lower end consisting of a screw working through a threaded aperture in the lower blade. By moving the slide towards the handle the blades are thrown open for cleaning or sharpening, and by pressing the blades together and returning slide to its previous position the Pen assumes its original adjustment.



No. 510. 511. 512.

A spring attached to lower blade, and bearing against the center wheel set screw, prevents the accidental rotation of latter while blades are open for cleaning.

Advantages over all other Ruling Pens.

1.—Simplicity of mechanical construction.
2.—Slide-catch, as well as the adjusting screw, can be operated with the one hand holding pen.
3.—No interference with adjusting screw in cleaning or sharpening.
4.—Large center wheel set screw allows of quick adjustment of blades.
5.—No hinge or lever to work loose.
6.—Durability of Pen.

No. 510.	Slide-Catch Ruling Pen, 4¼ in., ebony handle, . .	Each,	$1 95
511.	" " " " 5 " " " . .	"	2 10
512.	" " " " 5½ " " " . .	"	2 25

Above Pens furnished with aluminum handle, if preferred, at same prices.

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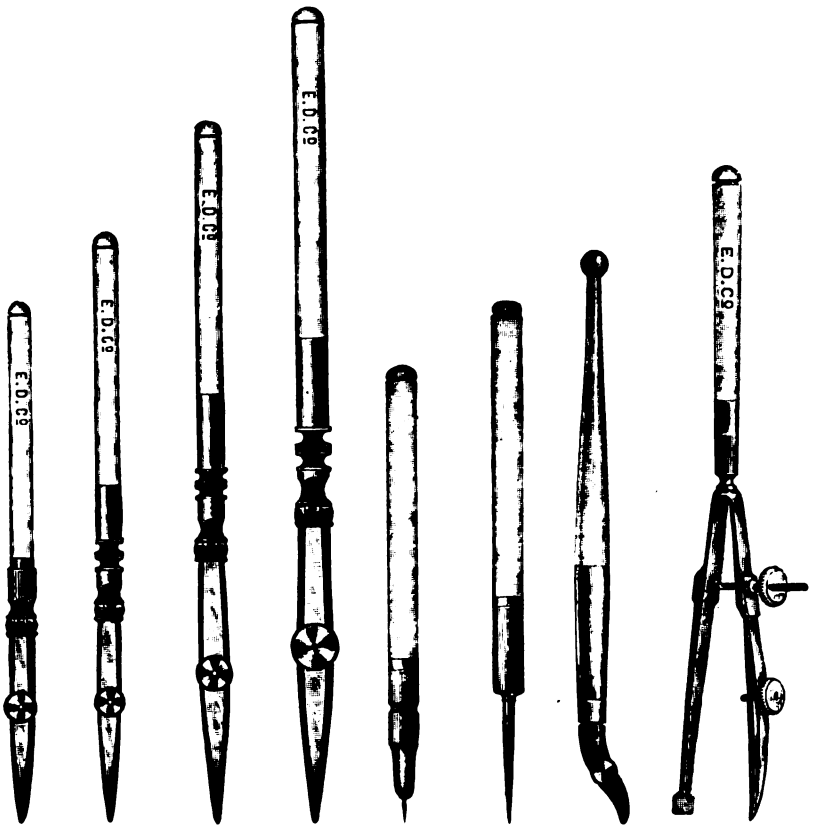
GEM UNION INSTRUMENTS

Highest Grade

Of Cold Rolled German Silver and Best English Tool Steel.

Each Instrument stamped E.D.C. and **Gem Union.**

Illustrations ⅔ size.



No. 518.	519.	520.	521.	527.	529.	530.	530A.

No. 518.	Ruling Pen, 4 in., ivory handle, with joint, . . .	Each,	$1 35
519.	" " 4¾ " " " " pin and joint,	"	1 50
520.	" " 5½ " " " " " "	"	1 80
521.	" " 6½ " " " " " "	"	1 95
522.	" " 5½ " " " " " " with German silver blades for colored inks,	"	1 80
527.	Pricker, ivory handle, ...	"	1 65
529.	Tracer, ivory handle, ...	"	1 00
530.	Curve Pen, 5 in., ivory handle, ...	"	1 80
530A.	Spline " 5 " " "	"	3 00

If desired we furnish aluminum handles in place of ivory handles for Nos. 518 to 522, at 15 cents each additional.

Pens carefully dressed and sharpened, each 20 to 25 cents.

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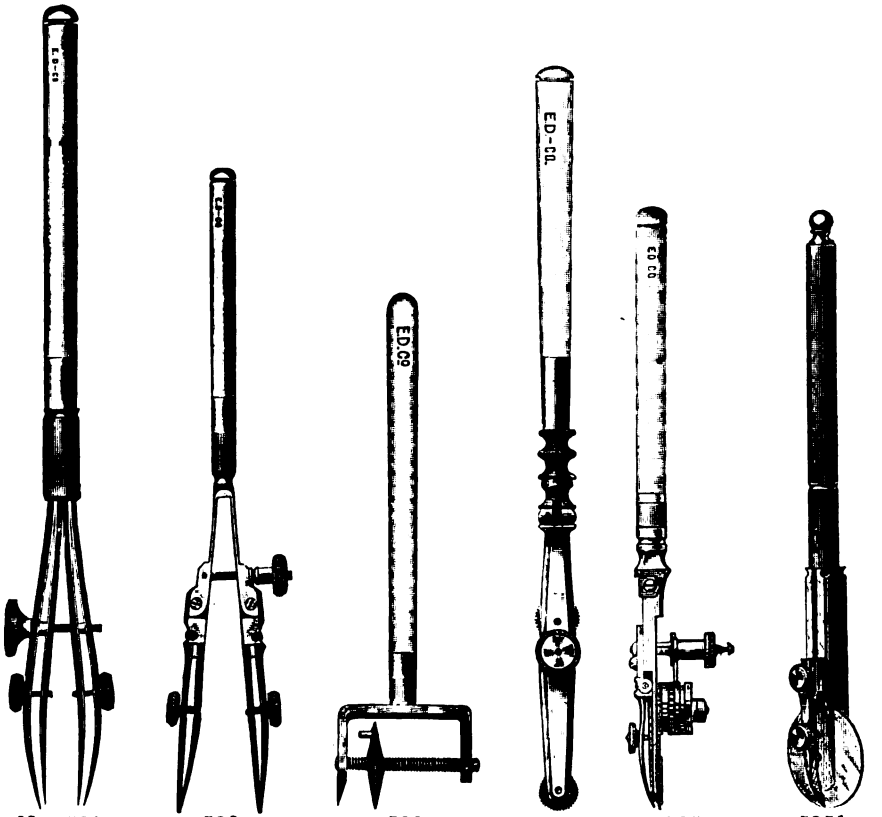
GEM UNION INSTRUMENTS

Highest Grade

Of Cold Rolled German Silver and Best English Tool Steel.

Each Instrument stamped ED and **Gem Union.**

Illustrations ⅔ size.



No. 531. 532. 533. 534. 535. 535½.

No. 531.	Border Pen, 6½ in., improved, ivory handle, . .	Each, $3 80
532.	Railroad " 5 " " " " . .	" 4 20
533.	Opisometer, ivory handle, for measuring curved lines,	" 1 80
	To operate, the wheel is rolled along the line to be measured, then, placing the instrument on the scale of the drawing, it is rolled backwards to the starting point.	
534.	Dotting Pen, 6 in., ivory handle, 6 wheels, with ink reservoir, improved, ...	" 4 25
535.	Superior Dotting Pen, 4¾ in., with 5 wheels, so arranged that different settings are obtained by simply turning the thumbscrew, ...	" 6 50
535½.	Knight Dotting Pen, 4¾ in., with 4 wheels, improved, .	" 5 00

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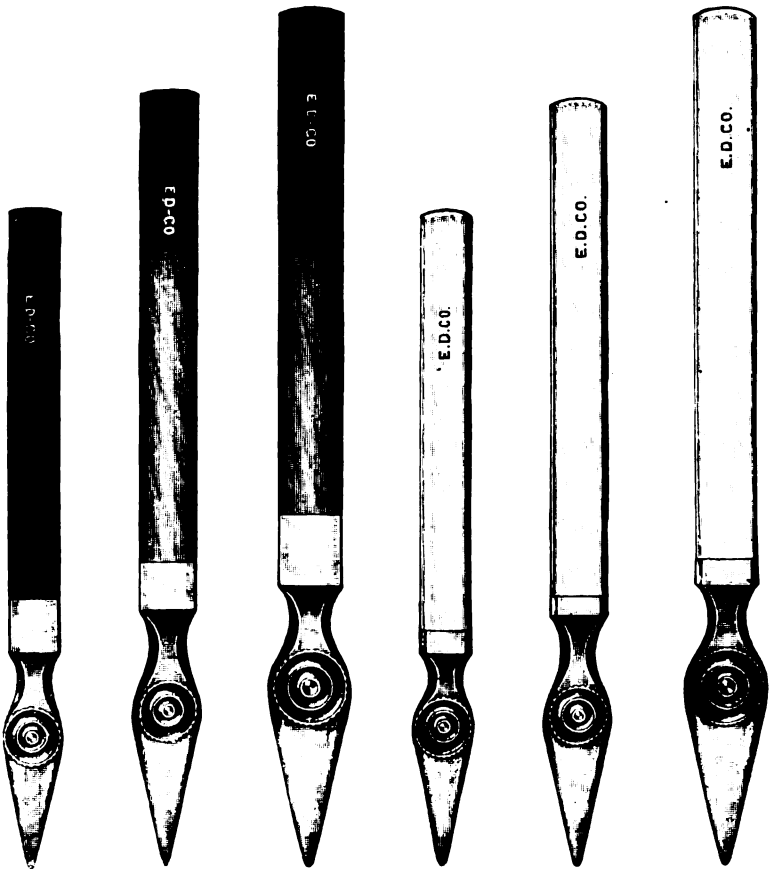
GEM UNION INSTRUMENTS

Highest Grade

Of Cold Rolled German Silver and Best English Tool Steel.

Each Instrument stamped ℰ and **Gem Union.**

Illustrations ¾ size.



No. 536. 537. 538. 543. 544. 545.

No. 536.	Swedish Detail Ruling Pen, 5 in., ebony handle, for long lines,	Each,	$1 50
537.	Swedish Detail Ruling Pen, 6 in., ebony handle, for long lines,	"	1 65
538.	Swedish Detail Ruling Pen, 7 in., ebony handle, for long lines,	"	1 80
543.	Swedish Detail Ruling Pen, 5 in., aluminum handle,	"	1 80
544.	" " " " 6 " " " "	"	2 10
545.	" " " " 7 " " " "	"	2 40

Pens carefully dressed and sharpened, 20 to 25 cents.

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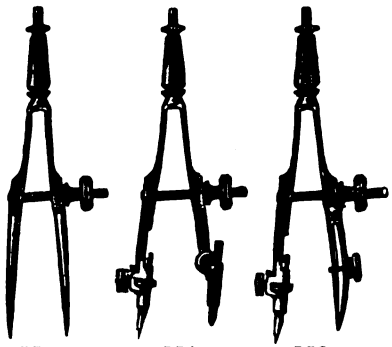
GEM UNION INSTRUMENTS

Highest Grade

Of Cold Rolled German Silver and Best English Tool Steel.

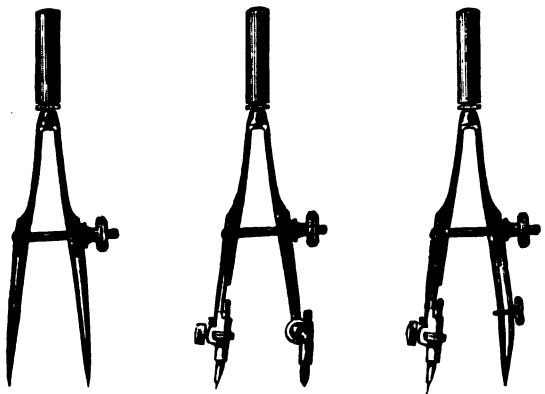
Each Instrument stamped Ⓔ and **Gem Union.**

Illustrations ⅔ size.



No. 550. 551. 552.

No. 550.	Minute Steel Spring Bow Dividers, 2½ in., metal handle, Each,	$1 80
551.	" " " " Pencil, 2½ " " " "	2 40
552.	" " " " Pen, 2½ " " " "	2 40
553.	Set of Bows, Nos. 550, 551 and 552, in morocco case, silk velvet lined, ... Per set,	8 40



No. 556. 557. 558.

No. 556.	Steel Spring Bow Dividers, 3 in., metal handle, . . Each,	$1 80
557.	" " " Pencil, 3 " " " . . "	2 40
558.	" " " Pen, 3 " " " . . "	2 40
559.	Set of Bows, Nos. 556, 557 and 558, in morocco case, silk velvet lined, ... Per set,	8 40

Above Bow Pencils and Bow Pens fitted with our patent screw-thread needle points. Patented Dec. 26, 1899

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GEM UNION INSTRUMENTS

Highest Grade

Of Cold Rolled German Silver and Best English Tool Steel.
Each Instrument stamped Ⓔ and **Gem Union.**
Illustrations ⅔ size.

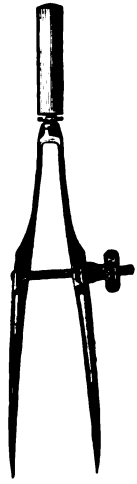
No. 560.

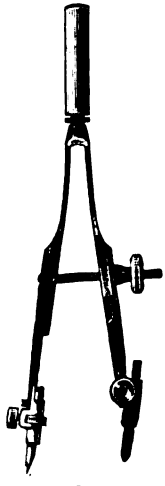
561.

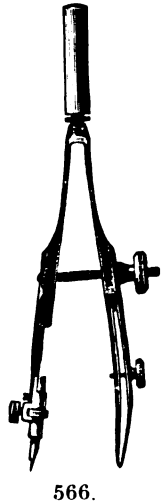
562.

No. 560.	Steel Spring Bow Dividers, 3 in., metal handle, . .	Each, $2 10
561.	" " " Pencil, 3 " " " . .	" 2 70
562.	" " " Pen, 3 " " " . .	" 2 70
563.	Set of Bows, Nos. 560, 561 and 562, in morocco case, silk velvet lined, ...	Per set, 8 70

These Bows have a screw on a right and left thread, which holds the points firmly in any position.


No. 564.


565.


566.

No. 564.	Steel Spring Bow Dividers, 3½ in., metal handle, . .	Each, $2 00
565.	" " " Pencil, 3½ " " " . .	" 2 50
566.	" " " Pen, 3½ " " " . .	" 2 50
567.	Set of Bows, Nos. 564, 565 and 566, in morocco case, silk velvet lined, ...	Per set, 8 20

Above Bow Pencils and Bow Pens fitted with our patent screw-thread needle points. Patented Dec. 26, 1899.

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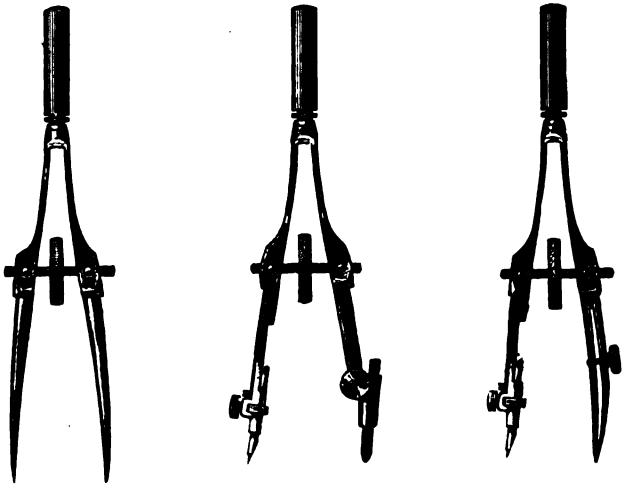
GEM UNION INSTRUMENTS *Highest Grade*

Of Cold Rolled German Silver and Best English Tool Steel.
Each Instrument stamped E.D.CO. and **Gem Union.**

Illustrations ⅓ size.



No. 568. 569. 570.

No. 568.	Steel Spring Bow Dividers, 3½ in., metal handle, . .	Each,	**$2 40**
569.	" " " Pencil, 3½ " " " . .	"	**3 00**
570.	" " " Pen, 3½ " " " . .	"	**3 00**

No. 571.

No. 571. Set of Bow, Nos. 568, 569 and 570, in morocco case, silk velvet lined, ... Per set, **$9 60**

These Bows have a screw on a right and left thread, which holds the points firmly in any position.

Above Bow Pencils and Bow Pens fitted with our patent screw-thread needle points. Patented Dec. 26, 1899.

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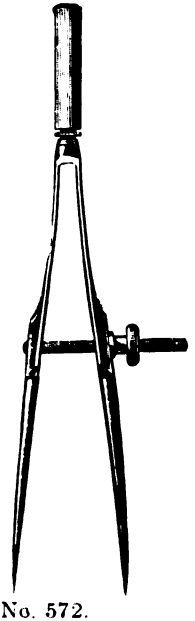
GEM UNION INSTRUMENTS

Highest Grade

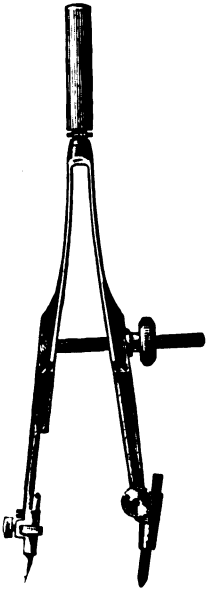
Of Cold Rolled German Silver and Best English Tool Steel.

Each Instrument stamped Ⓔ and **Gem Union.**

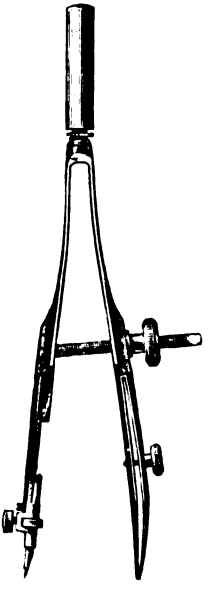
Illustrations ¾ size.



No. 572.



573.



574.

No. 572.	Steel Spring Bow Dividers, 4¾ in., metal handle, . . Each,	$2 40
573.	" " " Pencil, 4¾ " " " . . "	3 00
574.	" " " Pen, 4¾ " " " . . "	3 00
575.	Set of Bows, Nos. 572, 573 and 574, in morocco case, silk velvet lined, ... Per set,	9 60

Above Bow Pencils and Bow Pens fitted with our patent screw-thread needle points. Patented Dec. 26, 1899.

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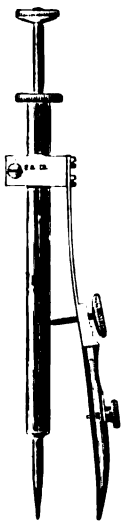
GEM UNION INSTRUMENTS

Highest Grade

Of Cold Rolled German Silver and Best English Tool Steel.

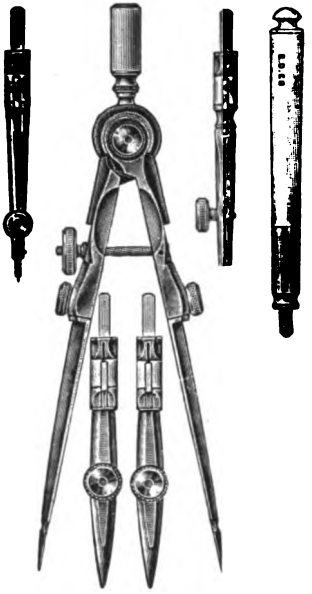
Each Instrument stamped Ⓖ and **Gem Union.**

Illustrations ⅔ size.



No. 583.

584.



588.

No. 583. Drop Spring Bow Pen, 4 in., self-adjusting, . . . Each, **$3 75**

584. " " " " with Pencil, 4 in., self-adjusting, " **5 00**

Nos. 583 and 584 are best adapted for drawing small circles. Scratching of pen and slipping of needle point is prevented by a small center rod which remains stationary while the attachment with pen or pencil point is turned, thus drawing circles by its own weight.

No. 588. Spring Bow Compasses, with long ivory handle, 2 steel points, 2 pen points, pencil and needle point, ... Each, **$8 25**

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GEM UNION INSTRUMENTS *Highest Grade*

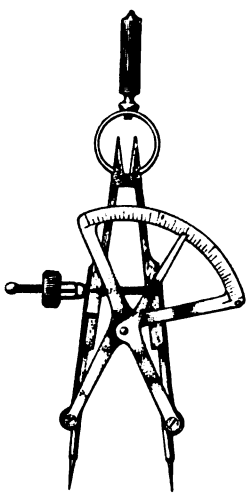
PRESTO-SET BOW INSTRUMENTS

Patented July 19, 1910.

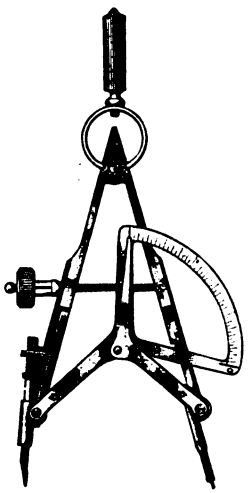
Of Cold Rolled German Silver and Best English Tool Steel.

Each Instrument stamped Ⓔ and **Gem Union.**

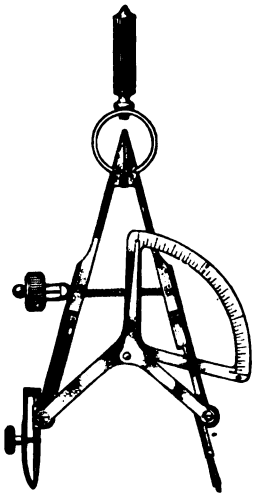
Illustrations ½ size.



No. 590.



591.



592.

No. 590.	Presto-Set Spring Bow Dividers, 3½ in., metal handle, Each,	$4 50
591.	" " " " Pencil, 3½ " " " "	5 00
592.	" " " " Pen, 3½ " " " "	5 00
593.	Set of Bows, Nos. 590, 591 and 592, in morocco case, silk velvet lined, ... Per set,	16 00

The Presto-Set Bow Instruments are of unique but practical construction. By means of an arc, accurately graduated into 32nds of an inch, and a self-clamping adjusting nut on the threaded spindle, the legs can be instantly set to any desired radius. They permit of extremely rapid work, with the advantage that the radius of the desired circle is obtained *without the use of an additional scale.* For very fine settings and quick, accurate work, they are unequaled.

The Bow Pencil has a screw adjustment for the lead, and the pen and needle points are renewable.

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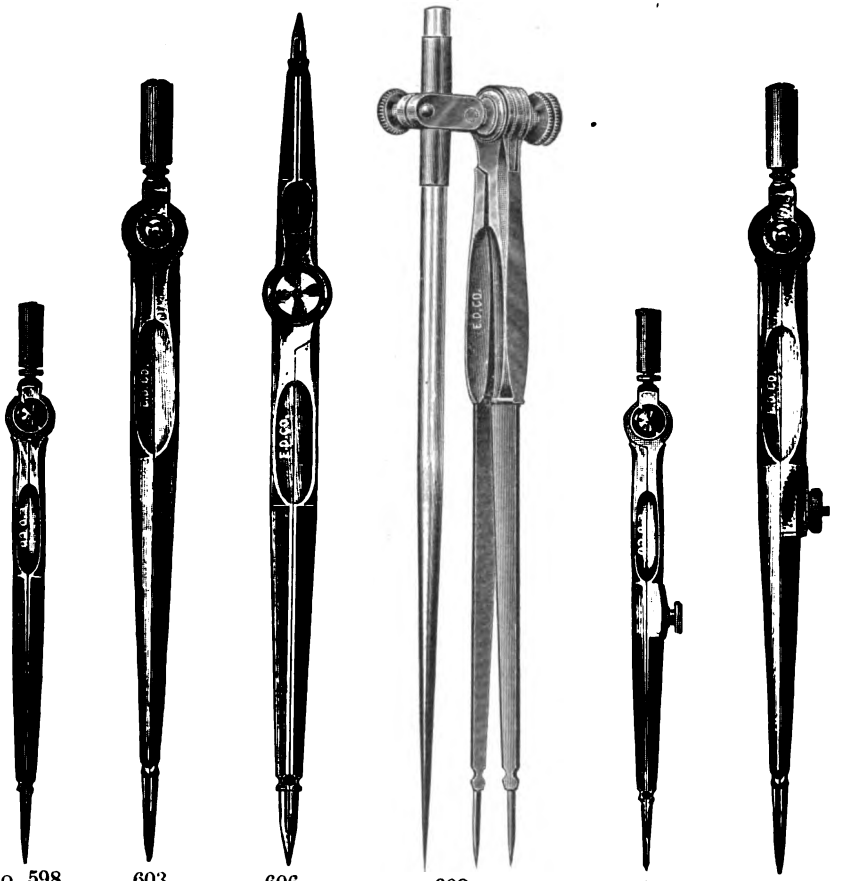
THE ELGIN CITIZEN CO.

GEM UNION INSTRUMENTS

Highest Grade

Of Cold Rolled German Silver and Best English Tool Steel.
Each Instrument stamped E. D. CO. and **Gem Union.**
Illustrations ⅔ size.



No. 598. 603. 606. 608. 614. 618.

No. 598.	Plain Dividers, 4¼ in., Union pivot joint and clamp,	Each,	$2 40
599.	" " 5 " " " " " "	"	2 60
603.	" " 6 " " " " " "	"	2 85
606.	Whole and Half Dividers, 7¼ in.,	"	3 90
608.	Three-Legged Dividers, adjustable leg, 6 in.,	"	6 30
614.	Hairspring Dividers, 4¼ in., Union pivot joint and clamp,	"	3 15
615.	" " 5 " " " " " "	"	3 40
618.	" " 6 " " " " " "	"	3 60
618S.	" " 6 " with Straightening Device,	"	4 20
620.	" " 7 " Union pivot joint and clamp,	"	4 20

For description of Union pivot joint and clamp, etc., see pages 63–67.

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GEM UNION INSTRUMENTS

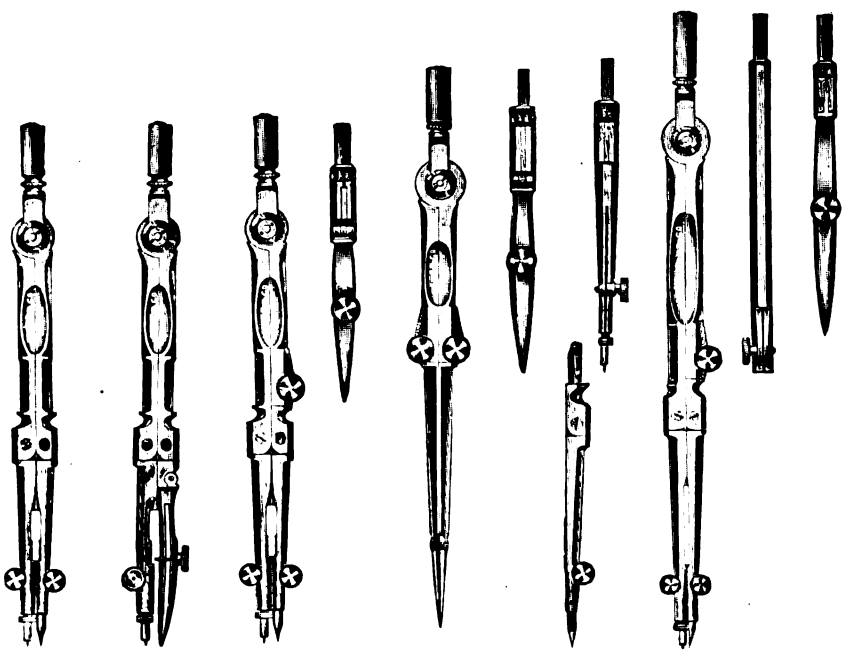
Highest Grade

Of Cold Rolled German Silver and Best English Tool Steel.

Each Instrument stamped Ⓔ and **Gem Union.**

Knowing the tongue-jointed instruments, with or without handle, to be inferior, less durable and less reliable than the pivot-jointed instruments, we omit to illustrate and to list them, though they bring comparatively a higher price, since it is much easier and cheaper to make a tongue joint than a pivot joint.

Illustrations ⅔ size.



No. 623. 625. 628. 629. 630.

No. 623.	Compasses, 4½ in., with fixed needle and pencil point, Union pivot joint and clamp, ...	Each,	$4 50
625.	Compasses, 4½ in., with fixed needle and pen point, Union pivot joint and clamp, ...	Each,	4 50
628.	Compasses, 4½ in., with fixed needle point, pen and pencil point, Union pivot joint and clamp, ...	Each,	6 15
629.	Compasses, 4½ in., with 2 steel points, pen, pencil and needle point, Union pivot joint and clamp, ...	Each,	7 25
630.	Compasses, 5 in., with fixed needle point, pen, pencil point and lengthening bar, Union pivot joint and clamp, .	Each,	7 25

Above Compasses fitted with our patent screw-thread needle points. Patented Dec. 26, 1899.

For description of Union pivot joint and clamp, see pages 63-67.

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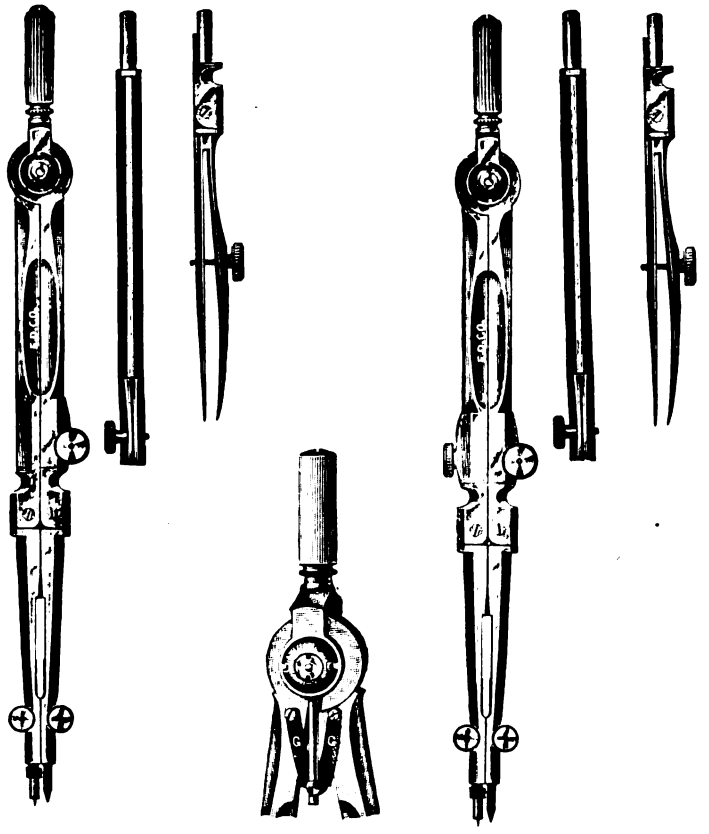
GEM UNION INSTRUMENTS

Highest Grade

Of Cold Rolled German Silver and Best English Tool Steel.
Each Instrument stamped E.D.CO. and **Gem Union.**
Illustrations ⅔ size.



No. 631. Straightening Device. 632.

No. 631.	Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar, Union pivot joint and clamp, . Each,	$7 40
631S.	Compasses, 6 in., like No. 631, but with Straightening Device, ... Each,	8 00
632.	Compasses, 6 in., hairspring, with fixed needle point, pen, pencil point and lengthening bar, Union pivot joint and clamp, ... Each,	8 40
632S.	Compasses, 6 in., like No. 632, but with Straightening Device, ... Each,	9 00

Above Compasses fitted with our patent screw-thread needle points.
Patented Dec. 26, 1899.

For description of Union pivot joint and clamp, also screw-thread needle point, see pages 63-67.

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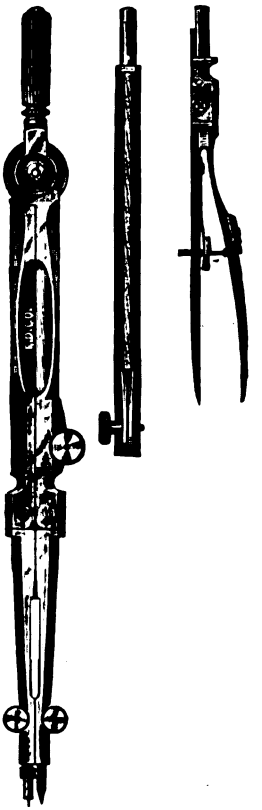
GEM UNION INSTRUMENTS

Highest Grade

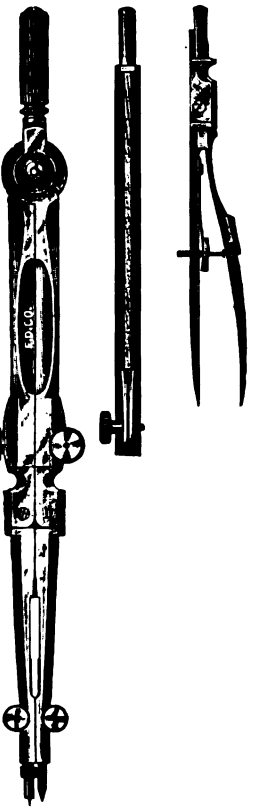
Of Cold Rolled German Silver and Best English Tool Steel.

Each Instrument stamped E.D.C.O. and **Gem Union.**

Illustrations ⅔ size.



No. 631P.



632P.

No. 631P. Compasses, 6 in., with fixed needle point, **patent slide-catch pen**, pencil point and lengthening bar, Union pivot joint and clamp, ... Each, $8 75

632P. Compasses, 6 in., hairspring, with fixed needle point, **patent slide-catch pen,** pencil point and lengthening bar, Union pivot joint and clamp, ... Each, 9 65

Our patent slide-catch device on above pen allows the pen to be opened for cleaning or sharpening without changing the adjustment for width of lines. Patented April 17, 1900. A full description of this form of pen will be found under Ruling Pens Nos. 510–512.

Above Compasses fitted with our patent screw-thread needle points.

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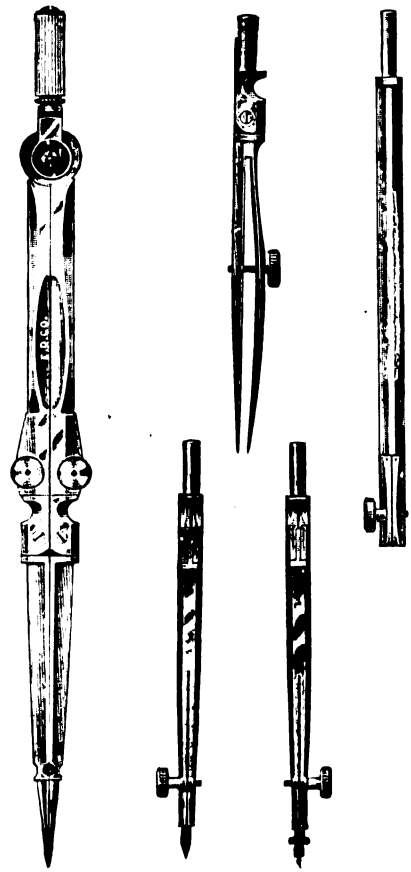
GEM UNION INSTRUMENTS

Highest Grade

Of Cold Rolled German Silver and Best English Tool Steel.

Each Instrument stamped ⓔ and **Gem Union.**

Illustrations ⅔ size.



No. 633.

No. 633. Compasses, 7 in., with joint in each leg and with 2 steel points, pen, pencil point, lengthening bar and needle point. Union pivot joint and clamp, ... Each, **$9 90**

For Empty Morocco Cases and Parts of Instruments, see pages 168-169.

For description of Union pivot joint and clamp and screw-thread needle point, see pages 63-67.

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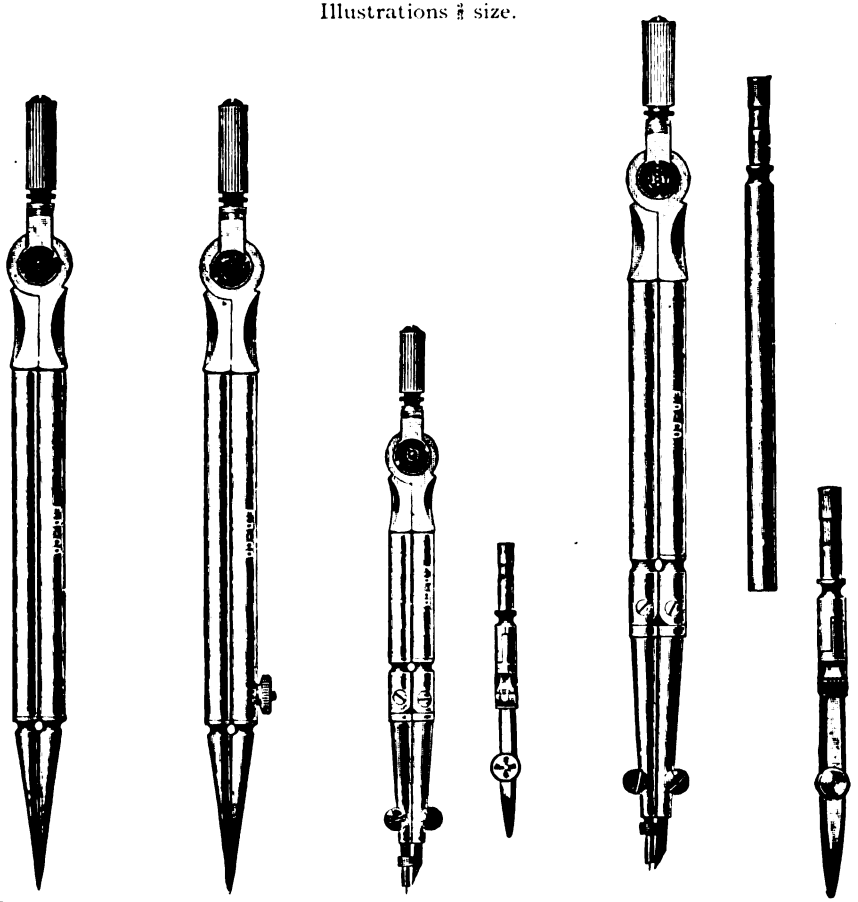
CYLINDRICAL GEM UNION INSTRUMENTS

The Highest Grade of Instruments.

Of Cold Rolled German Silver and Best English Tool Steel.

Each Instrument stamped Ⓔ and **Gem Union.**

Illustrations ⅜ size.



No. 635. 637. 640. 642.

No. 635.	Plain Dividers, 6 in., Union pivot joint and clamp, .	Each,	$2 70
637.	Hairspring Dividers, 6 in., Union pivot joint and clamp,	"	3 30
640.	Compasses, 4½ in., with fixed needle point, pen and pencil point, Union pivot joint and clamp, ...	"	6 00
642.	Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar, Union pivot joint and clamp,	"	7 50

Above Compasses fitted with screw-thread needle points. Pat. Dec. 26, 1899.

For description of Union pivot joint and clamp, and screw-thread needle point, see pages 63-67.

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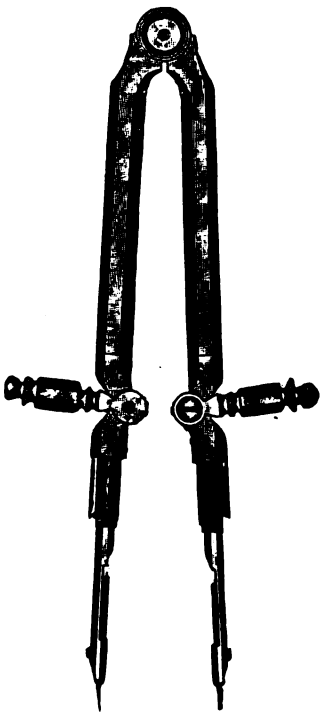
GEM UNION INSTRUMENTS

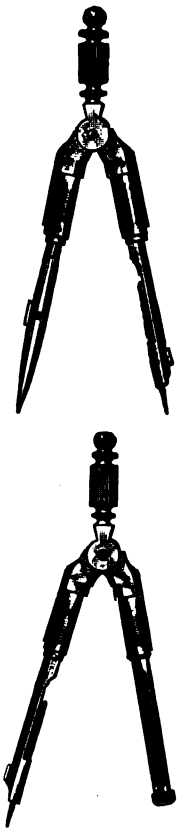
Highest Grade

Of Cold Rolled German Silver and Best English Tool Steel.
Each Instrument stamped E and **Gem Union.**
Illustrations ⅔ size.



No. 644.
Open
for large circles.

644.
Folded.



644.
Drawn out
for small circles.

644½.

No. 644. Pillar Pocket Compasses, with two needle points and pen and pencil points, which can be withdrawn from Compasses to be used separately as Bow Pencil and Bow Pen, respectively, Each, **$10 20**

644C. No. 644, in morocco pocket case, ... Each, **11 70**

644½. Tubular Compasses, 10 in., with steel slide bars, each extending 14⅜ in., and pencil, pen and needle points, . Each, **17 00**

Any circle up to about 50 in. diameter can be made with this instrument.

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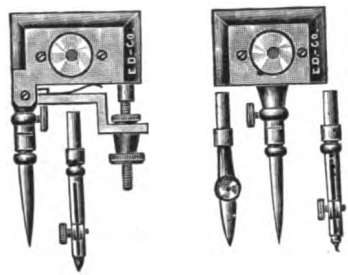
GEM UNION INSTRUMENTS

Highest Grade

Of Cold Rolled German Silver and Best English Tool Steel.

Each Instrument stamped and **Gem Union.**

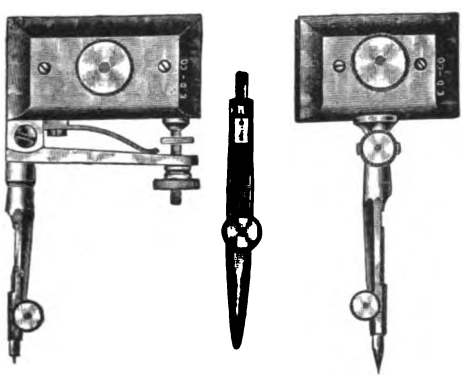
Illustrations ⅔ size.



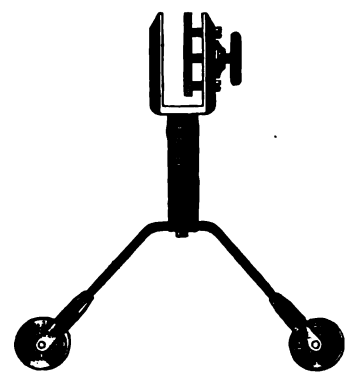
No. 645.

No. 645. Minute Beam Compasses, with 2 steel points, pen, pencil and needle point, ... Each, $ 7 50

645C. Minute Beam Compasses No. 645 in morocco pocket case, silk velvet lined, ... " 8 75



No. 646.



647.

No. 646. Beam Compasses, to fit on any straight edge, with two needle points, exchangeable for lead, and pen point, and micrometer adjustment, ... Each, $ 8 50

646C. Beam Compasses No. 646 in morocco pocket case, silk velvet lined, ... " 9 75

647. Wheel attachment for No. 646, ... " 2 25

647C. Nos. 646 and 647, in morocco pocket case, silk velvet lined, ... " 12 50

For Beam Compass Bars, see No. 2119.

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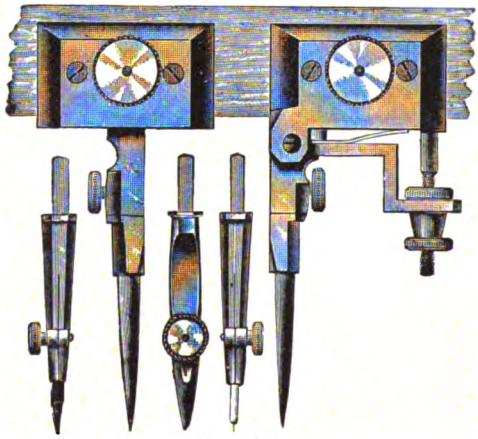
GEM UNION INSTRUMENTS

Highest Grade

Illustrations ⅔ size.



Each Instrument stamped Ⓔ and **Gem Union.**

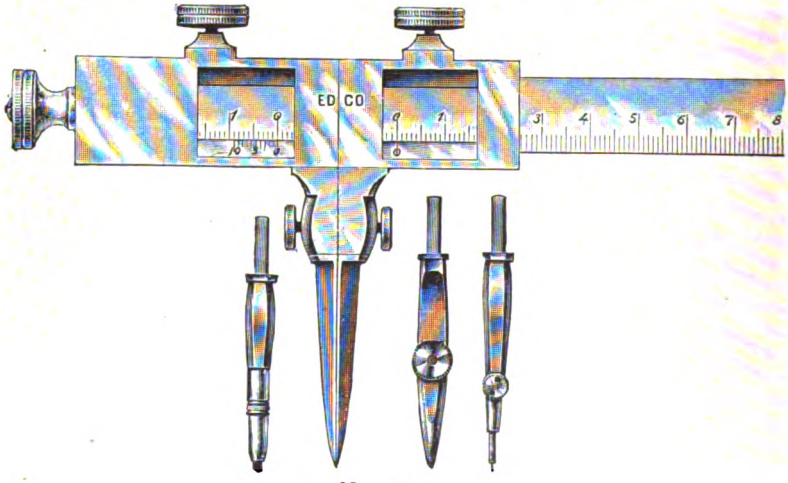
No. 648.

No. 648. Beam Compasses, to fit any straight edge, with two steel points, pen, pencil and needle point, and micrometer adjustment, ... Each, $ 9 00

648C. Beam Compasses, No. 648 in morocco pocket case, silk velvet lined, ... " 10 25

648½. Wheel attachment for No. 648, ... " 2 25

649C. Nos. 648 and 648½ in morocco pocket case, silk velvet lined, ... " 13 00



No. 650.

No. 650. German Silver Beam Compasses, with 2 triangular steel points, pen, pencil and needle points and wheel attachment; rectangular tubular bar of German silver 44 in. long, micrometer adjustment; upper and lower edge and verniers graduated to any scale desired. Instrument complete, in polished mahogany box, ... Each, $35 00

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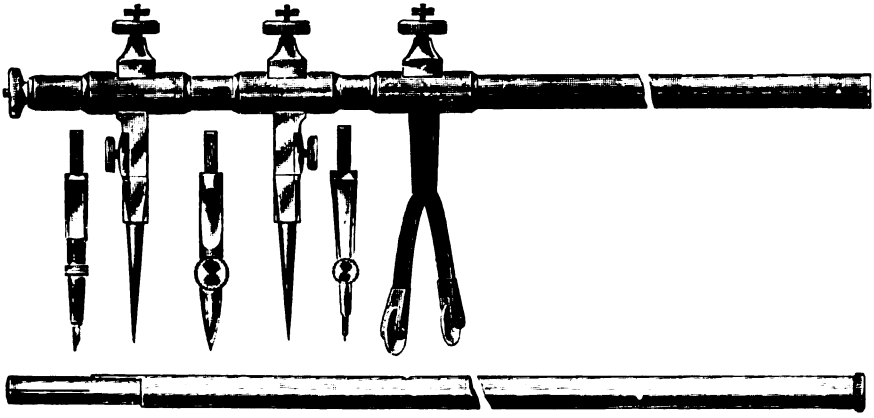
GEM UNION INSTRUMENTS

Highest Grade

Of Cold Rolled German Silver and Best English Tool Steel.

Illustrations ⅛ size.



No. 651.—With Wheel Attachment, No. 654.

No. 651.	Tubular Beam Compasses, 18 in., 2 round German silver bars, with 2 steel points, pen, pencil and needle point, with micrometer adjustment. . . . . Each,	$10 50
652.	Tubular Beam Compasses, 24 in., 3 bars, . . . "	11 75
653.	" " " 36 in., 3 " . . . "	13 00
651C.	" " " No. 651 in morocco case, "	12 50
652C.	" " " No. 652 " " " "	14 00
653C.	" " " No. 653 " " " "	16 25
654.	Wheel Attachment for Nos. 651 or 652, ... "	2 50
654½.	" " " No. 653, ... "	2 75
651W.	No. 651 and No. 654 in morocco case, ... "	15 00
652W.	No. 652 " " 654 " " " . . . . "	17 00
653W.	No. 653 " " 654½ " " " . . . . "	19 50

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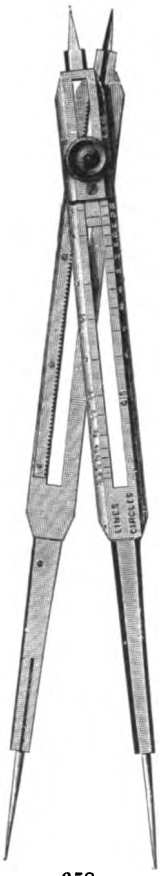
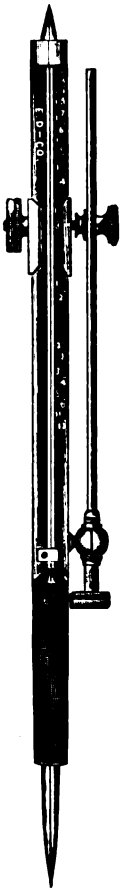
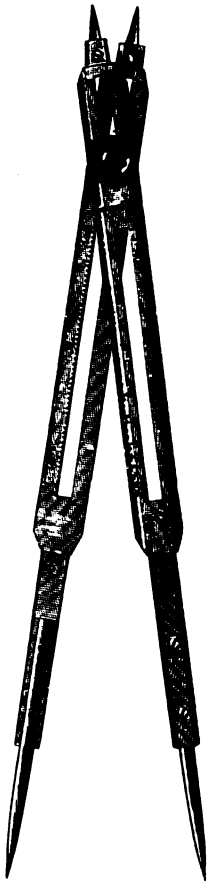
GEM UNION INSTRUMENTS

Highest Grade

Ill. ⅜ size. Illustrations ½ size.

No 655. 658. 660. 663.

No. 655.	Proportional Dividers, 7½ in., with exchangeable points, finely graduated for lines and circles, .	Each, $10 00
658.	Proportional Dividers, 8½ in., with rack movement and exchangeable points, finely graduated for lines and circles, ...	" 12 50
660.	Proportional Dividers, 9 in., with micrometer adjustment and exchangeable points, finely graduated for lines, circles, planes and solids, ...	" 16 50
663	Proportional Dividers, 9 in., with rack movement, exchangeable and adjustable points, finely graduated for lines and circles, ...	" 15 00

Morocco Cases, lined with silk velvet, for:

	No. 655	658	660	663
Each, ...	$0 80	90	1 20	1 10

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GEM UNION INSTRUMENTS

Highest Grade

STANDARD PROPORTIONAL DIVIDERS

Illustrations ½ size.

No. 666.

An improved instrument, graduated in such a manner that with the aid of table furnished any ratio may be speedily and accurately set off.

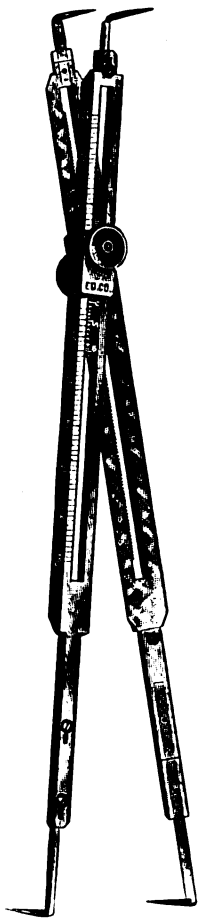
The purposes for which these Dividers may be used are almost limitless. The engraved divisions run from 10 to 110 and with the aid of the vernier to 1,000. A table giving a large number of settings such as "Diameter and Circumference of a Circle," "Diameter of a Circle and Side of Inscribed Square," "Side of Cube and Diameter of Equal Sphere," "Miles and Kilometers," etc., etc., is furnished with each instrument, and by means of a simple formula any setting not given may be easily obtained.

After having obtained the setting for the desired ratio, the slide is moved to that point, when the ends of the dividers will indicate the ratio.
Thus:

According to the table, the setting for "Miles and Kilometers" is 767, and the slide being moved to that point with the aid of the vernier, the ends of the instrument will indicate the desired ratio.

Each division of the Standard Proportional Divider represents one 200th part of its entire length, but only 100 divisions appear on the instrument.

No. 666. **Standard Proportional Dividers, 10 in., with rack movement, exchangeable points and table of settings.** In polished case, . Each, $14 00



668.

No. 667. Standard Proportional Dividers, 10 in., with rack movement, exchangeable and adjustable points, and table of settings. In polished case, ... Each, $17 00

668. Standard Proportional Dividers, 10 in., with rack movement, exchangeable and adjustable points, and table of settings. In polished case, ... Each, 20 00

The points of this Instrument are bent rectangular, in opposite directions, so as to accomplish easier manipulation and a closer contact with the drawing surface.

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GEM UNION INSTRUMENTS

IN POCKET BOOK STYLE CASES, LINED WITH SILK VELVET.

The Highest Grade of Instruments.

Of Cold Rolled German Silver and Best English Tool Steel.

For description of Instruments, see pages 63-67.

Our assortment comprises a selection of the most desirable instruments, fitted in cases. Any other assortments in Pocket Book Style Cases or Morocco Pocket Cases, fitted up to order at short notice.

No. 685.

No. 685. Cont'g:

No. 518 Ruling Pen, 4 in., with joint, ivory handle.
598 Plain Dividers, 4¼ in., Union pivot joint and clamp.
628 Compasses, 4¼ in., fixed needle point, pen and pencil point, Union pivot joint and clamp.
Box with Leads. Per set, ... **$12 00**

No. 688.

No. 688. Cont'g:

No. 520 Ruling Pen, 5½ in., with pin and joint, ivory handle.
603 Plain Dividers, 6 in., Union pivot joint and clamp.
631 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar, Union pivot joint and clamp.
Box with Leads. Per set, ... **$14 50**

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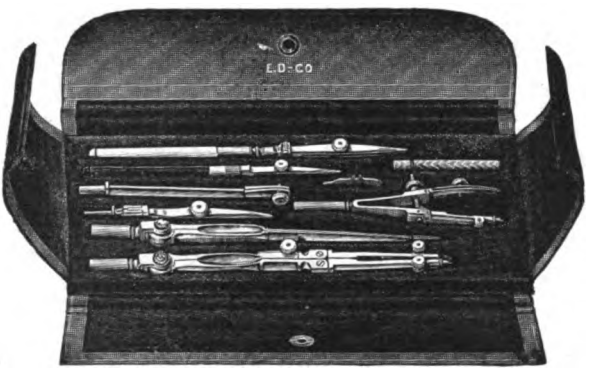
GEM UNION INSTRUMENTS IN CASES *Highest Grade*

Of Cold Rolled German Silver and Best English Tool Steel.



No. 690.

No. 690. Cont'g:

No. 506 Ruling Pen, 4½ in., with spring and ebony handle.

520 " " 5½ " with pin and joint, ivory handle.

566 Steel Spring Bow Pen, 3½ in., metal handle.

603 Plain Dividers, 6 in., Union pivot joint and clamp.

631 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar, Union pivot joint and clamp.

Box with Leads. Per set, ... $19 00

No. 691. Containing the same as No. 690, but having Cylindrical Dividers No. 635 and Compasses No. 642 in place of Nos. 603 and 631.

Per set, ... $18 40

Any other assortments in morocco cases fitted up to order at short notice.

For description of Instruments, see pages 63-67.

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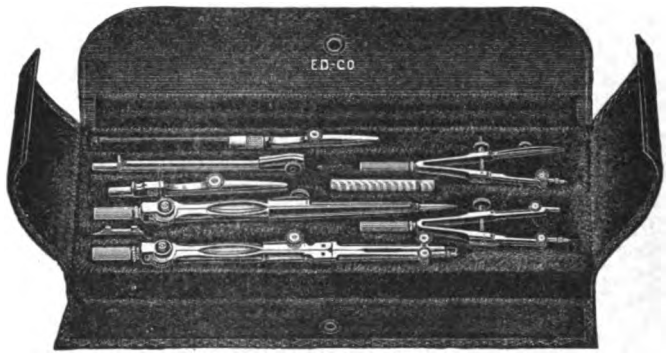
GEM UNION INSTRUMENTS IN CASES *Highest Grade*

Of Cold Rolled German Silver and Best English Tool Steel.



No. 693.

No. 693. Cont'g:

No. 507 Ruling Pen, 5 in., with spring and ebony handle.

565 Steel Spring Bow Pencil, 3½ in., metal handle.

566 " " " Pen, 3½ " " "

618 Hairspring Dividers, 6 in., Union pivot joint and clamp.

631 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar, Union pivot joint and clamp.

Box with Leads. Per set, ... **$21 00**

No. 694. Containing the same as No. 693, but having Cylindrical Hairspring Dividers No. 637 and Compasses No. 642 in place of Nos. 618 and 631.

Per set, ... **$20 40**

Any other assortment of instruments fitted into a case at short notice.

See Empty Morocco Cases on pages 168-169.

For description of Instruments, see pages 63-67.

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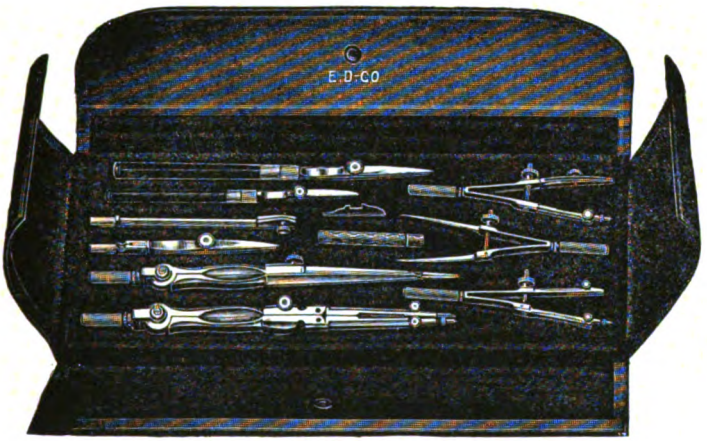
GEM UNION INSTRUMENTS IN CASES *Highest Grade*

Of Cold Rolled German Silver and Best English Tool Steel.



No. 695.

No. 695. Cont'g:

No. 506 Ruling Pen, 4¼ in., with spring and ebony handle.
508 " " 5½ " " " " " "
564 Steel Spring Bow Dividers, 3½ in., metal handle.
565 " " " Pencil, 3½ " " "
566 " " " Pen, 3½ " " "
618 Hairspring Dividers, 6 in., Union pivot joint and clamp
631 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar, Union pivot joint and clamp
Box with Leads. Per set, ... $24 00

No. 696. Containing the same as No. 695, but having Cylindrical Hairspring Dividers No. 637 and Compasses No. 642 in place of Nos. 618 and 631.
Per set, ... $23 80

Any other assortments in morocco cases fitted up to order at short notice.

For Description of Instruments, see pages 63-67.

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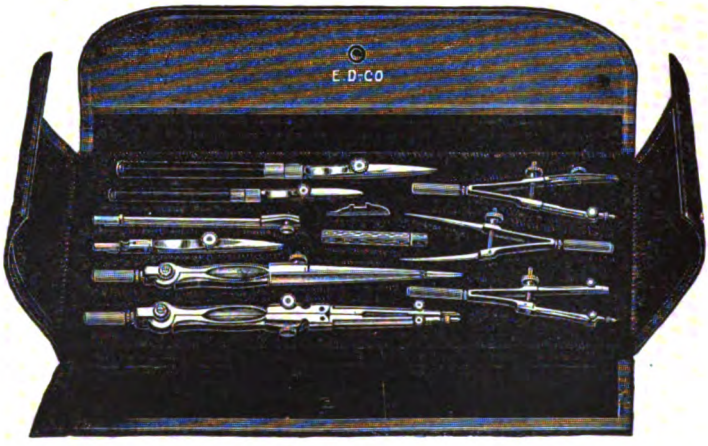
GEM UNION INSTRUMENTS IN CASES *Highest Grade*

Of Cold Rolled German Silver and Best English Tool Steel.



No. 700.

No. 700. Cont'g:

No. 506 Ruling Pen, 4½ in., with spring and ebony handle.
508 " " 5½ " " " " " "
564 Steel Spring Bow Dividers, 3½ in., metal handle.
565 " " " Pencil, 3½ " " "
566 " " " Pen, 3½ " " "
618 Hairspring Dividers, 6 in., Union pivot joint and clamp.
632 Compasses, 6 in., hairspring, with fixed needle point, pen, pencil point and lengthening bar, Union pivot joint and clamp.

Box with Leads. Per set, ... **$25 00**

No. 702. Containing the same as No. 700, but having center wheel Bows Nos. 568, 569 and 570 in place of Nos. 564, 565 and 566.

Per set, ... **$26 40**

For description of Instruments, see pages 63-67.

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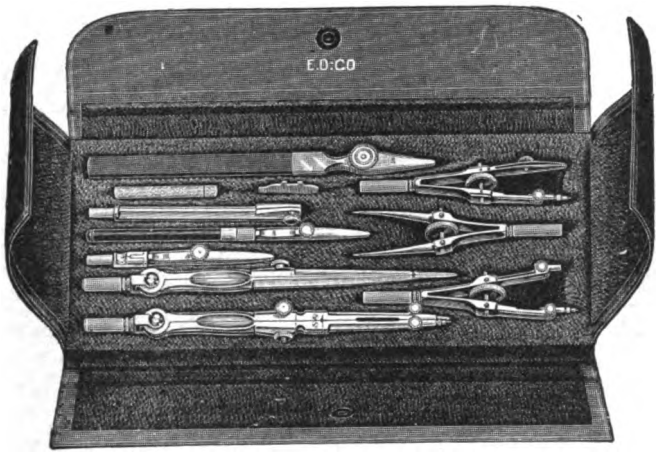
GEM UNION INSTRUMENTS IN CASES *Highest Grade*

Of Cold Rolled German Silver and Best English Tool Steel.



No. 710.

No. 710. Cont'g:

No. 507 Ruling Pen, 5 in., with spring and ebony handle.

537 Swedish Detail Pen, 6 in., ebony handle.

568 Steel Spring Bow Dividers, 3½ in., metal handle.

569 " " " Pencil, 3½ " " "

570 " " " Pen, 3½ " " "

618 Hairspring Dividers, 6 in., Union pivot joint and clamp.

632 Compasses, 6 in., hairspring, with fixed needle point, pen, pencil point and lengthening bar, Union pivot joint and clamp.

Box with Leads. Per set, ... **$26 40**

No. 712. Containing the same as No. 710, but having Compasses No. 631 in place of No. 632.

Per set, ... **$25 40**

For description of Instruments, see pages 63-67.

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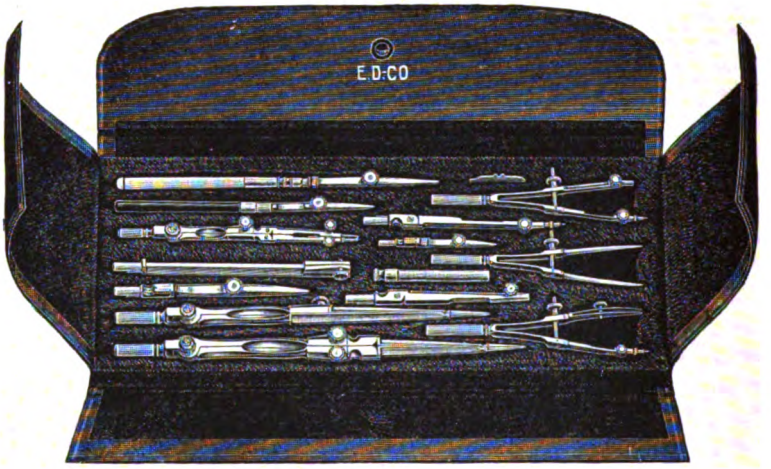
GEM UNION INSTRUMENTS IN CASES *Highest Grade*

Of Cold Rolled German Silver and Best English Tool Steel.



No. 715.

No. 715. Cont'g:

No. 506 Ruling Pen, 4¼ in., with spring and ebony handle.
520 " " 5½ " with pin and joint, ivory handle.
564 Steel Spring Bow Dividers, 3½ in., metal handle.
565 " " " Pencil, 3½ " " "
566 " " " Pen, 3½ " " "
618 Hairspring Dividers, 6 in., Union pivot joint and clamp.
628 Compasses, 4¼ in., with fixed needle point, pen and pencil point, Union pivot joint and clamp.
633 Compasses, 7 in., with 2 steel points, pen, pencil point, needle point and lengthening bar, Union pivot joint and clamp.

Box with Leads. Per set, ... **$34 50**

No. 716. Containing same assortment as No. 715, but having Compasses No. 631 in place of No. 633 and Ruling Pen No. 508 in place of No. 520.

Per set, ... **$31 50**

Any other assortments in morocco cases fitted up to order at short notice.

See Empty Morocco Cases on pages 168-169.

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GEM UNION INSTRUMENTS IN CASES *Highest Grade*

Of Cold Rolled German Silver and Best English Tool Steel.

No. 720.

No 720. Morocco Case, with recessed and partitioned lid with hinged cushion. The lid is arranged for holding pencils, penholders, pens, rubber, tacks, chinese ink, pencil pointer, etc.

Cont'g:

No. 506 Ruling Pen, 4½ in., with spring and ebony handle.
508 " " 5½ " " " " " "
564 Steel Spring Bow Dividers, 3½ in., metal handle.
565 " " " Pencil, 3½ " " "
566 " " " Pen, 3½ " " "
618 Hairspring Dividers, 6 in., Union pivot joint and clamp.
631 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar, Union pivot joint and clamp.

Box with Leads. Per set, ... $25 25

No. 722. Morocco Case, containing the same as No. 720, but having Compasses No. 632 in place of No. 631.

Per set, ... $26 25

For description of Instruments, see pages 63–67.

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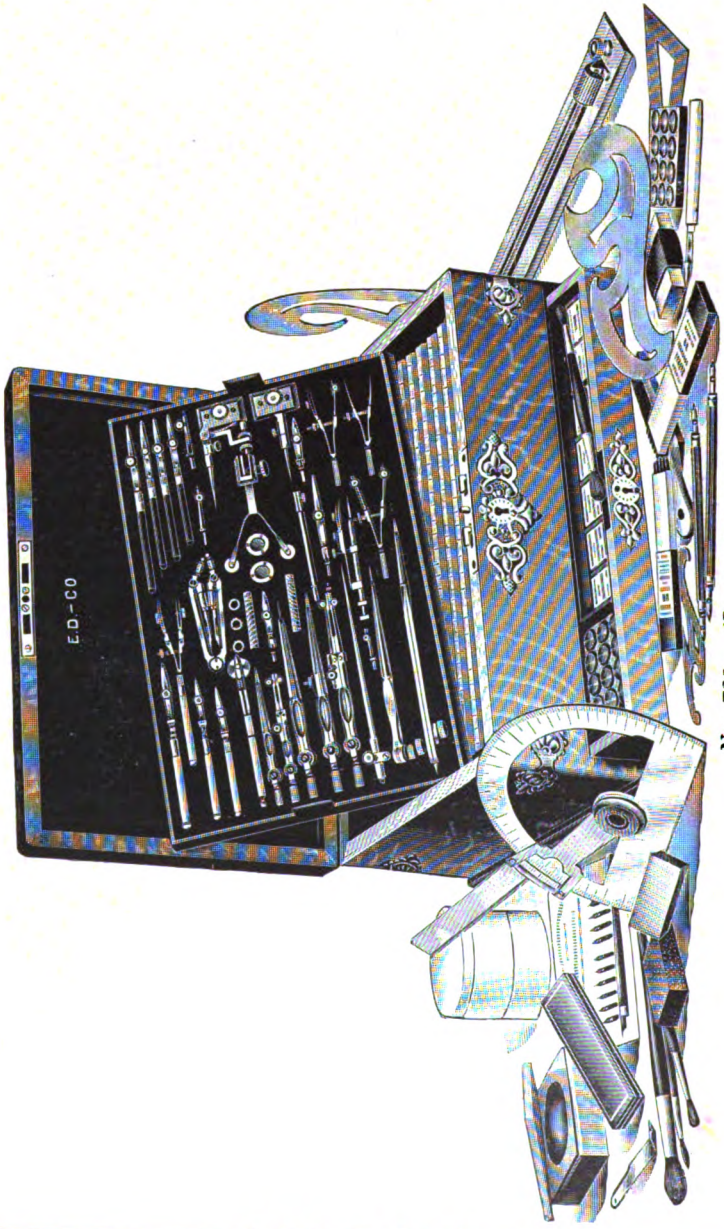
GEM UNION INSTRUMENTS

Highest Grade

Of Cold Rolled German Silver and Best English Tool Steel.



No. 723. (See next page.)

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No. 723. Containing a very complete outfit of the best tools, in fine polished case with German silver corners, lock, tray and drawer, viz.:

No. 506, 1 Ruling Pen, 4½ in., spring on upper blade, ebony handle;
507, 1 " " 5 " " " " " " " "
508, 1 " " 5½ " " " " " " " "
511. 1 " " 5 in., ebony handle; slide catch cleaning device;
518, 1 Ruling Pen, 4 in., with joint and ivory handle;
519, 1 " " 4¾ " with joint and pin, ivory handle;
520, 1 " " 5½ " " " " " " "
532, 1 Railroad Pen, 5 in., ivory handle;
564, 565, 566, 1 set of 3 Steel Spring Bow Instruments;
584. 1 Self-Adjusting Spring Bow Pen with pencil point;
585½, 1 Dotting Pen;
598, 1 Plain Divider, 4½ in., Union pivot joint and clamp;
603, 1 " " 6 in., Union pivot joint and clamp;
608, 1 Three-legged Divider, 6 in., with adjustable leg;
618, 1 Hairspring Divider, 6 in., Union pivot joint and clamp;
628, 1 Compass, 4½ in., with fixed needle point, pen and pencil point, Union pivot joint and clamp;
631, 1 Compass, 6 in., with pencil, pen and fixed needle point and lengthening bar, Union pivot joint and clamp;
644, 1 Pillar Compass;
648, 1 Beam Compass;
648½, 1 Beam Compass Wheel Attachment;
658, 1 Proportional Divider, 8½ in., with rack movement;
976, 2 boxes with Leads;
1581, 1 set of 8 Boxwood Scales, 12 in., full divided, ⅛, ¼, ⅜, ½, ¾, 1, 1½, 3 inch to the foot;
1852, 1 German Silver Rolling Parallel Rule, 12 in.;
1976, 1 " " Vernier Protractor, 8 in.;
2021, 1 Transparent Ambro Triangle, 10 in.;
2022, 1 " " " 8 in.;
2152, 1 " " Curve, each No. 6, No. 13, No. 15;
2364, 2376, 2 doz., each, Gem Union Thumb Tacks;
2460, 1 Tack Lifter;
2466, 2 Horn Centers, with German silver rim;
2600Q, 1 cake Chinese Ink;
2800, 1 whole pan, each, W. N. Water Colors—
8, 12, 16, 24, 26, 29, 46, 54, 70, 72.
2801, 1 whole pan, each, W. N. Water Colors—108, 128;
2802, 1 whole pan, W. N. Water Colors—200;
2803, 1 whole pan, W. N. Water Colors—320;
2920, 1 each, Camel Hair Brush, 1, 2, 3, 4, 5, 6;
2920, 1 Camel Hair Brush, 12;
2930, 1 each, Double Pointed Camel Hair Brush, 1, 3;
2940, 1 each, Red Sable Brush, 1, 3, 5, 7, 8, 10;
3000, 1 Slate Ink Slab;
3011, 1 nest of Saucers;
3110, 2 double-pointed Siberian Artists' Pencils;
3120, 3 boxes Siberian Leads;
3321, 1 Sponge Rubber;
3350, 2 Artists' Rubber, large;
3361, 2 Ink Erasers, large;
3371, 1 Ink and Pencil Eraser;
3396, 1 Steel Eraser;
3416, 1 Pencil Pointer;
3452, 1 doz. finest Steel Pens, with Holder.

No. 723, complete, ... Each, $185 00

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EXCELLO INSTRUMENTS OF PRECISION

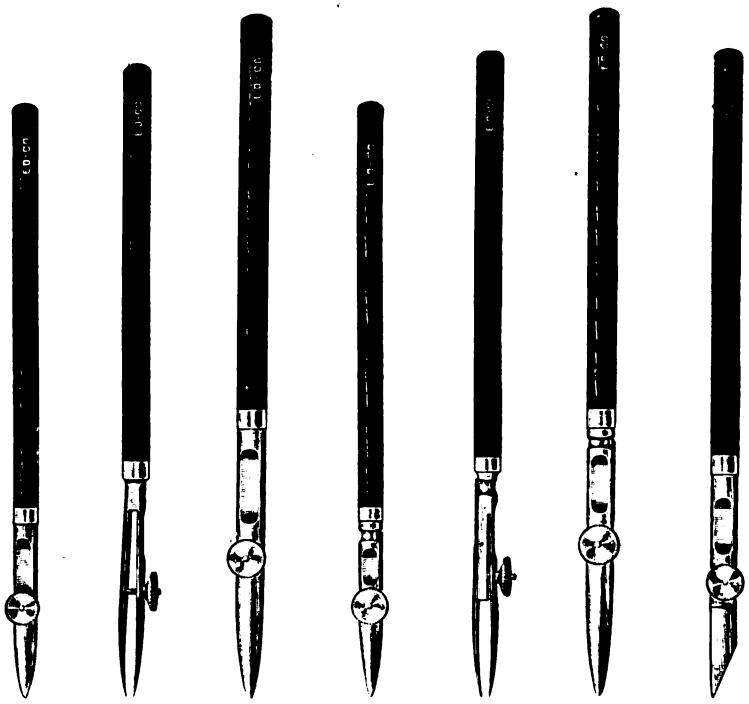
The Highest Grade of Instruments.

Of Cold Rolled German Silver and Best English Tool Steel.

Each Instrument stamped Ⓔ and **Excello.**

For description see pages 68–71.

Illustrations ⅜ size.



No. 725. 726. 727. 728. 729. 730. 730½.

No. 725.	Ruling Pen, 4½ in.,	metal handle, ...	Each,	$1 00
726.	" " 5 "	"	"	1 20
727.	" " 5½ "	"	"	1 35
728.	" " 4½ "	" with cross joint, .	"	1 50
729.	" " 5 "	" " " " .	"	1 65
730.	" " 5½ "	" " " " .	"	1 80
730½.	" " 5 "	" for fine lines, . .	"	1 50

Ruling Pens with cross joint are so constructed that the blades may be easily separated and thoroughly cleaned, without disturbing the adjusting screw, thereby preserving the original adjustment.

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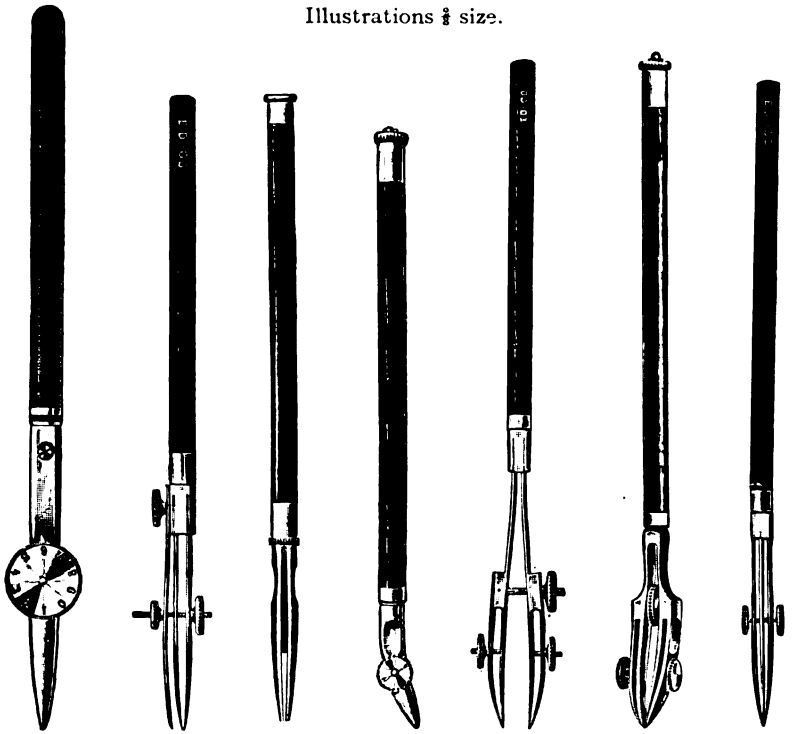
Of Cold Rolled German Silver and Best English Tool Steel.

Each Instrument stamped Ⓔ and **Excello.**

Illustrations ⅜ size.



No. 731. 732½. 733. 734. 736. 737. 738.

No. 731.	Ruling Pen 5½ in., with graduated thumb screw, .	Each,	$1 80
732.	" " 5½ " " thumb screw and cross joint,	"	2 40
732½.	" " 5 " " third blade, by means of which cross hatching can be easily done and the lines minutely regulated, ...	"	1 75
733.	Wedge Ruling Pen, 5¼ in., which opens and closes by turning thumb screw at upper end of handle, . . .	"	1 50
734.	Curve Pen, 4¾ in., blades fastened to a rod in a hollow handle, with screw at upper end to set pen firm for straight lines, or loose to follow curves, ...	"	1 65
736.	Railroad Pen, 5¼ in., black handle, ...	"	2 70
737.	Double Curve Pen, 5¼ in., same construction as No. 734,	"	4 80
738.	Three-tongued Pen, 5 in., for heavy lines, ...	"	2 00

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Of Cold Rolled German Silver and Best English Tool Steel.

Each Instrument stamped Ⓔ and **Excello.**

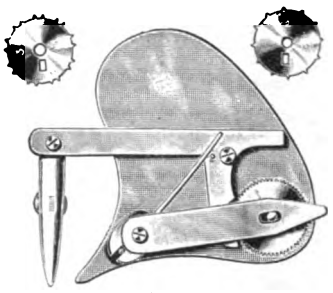
Illustrations ⅔ size.

No. 739.

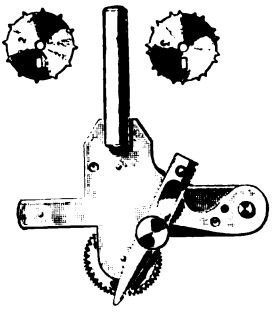
740.

742.

743.



745.



745½.

No. 739.	Swedish Ruling Pen, 6 in., metal handle, ...	Each, $1 35
740.	" " " 6 " " "	" 1 50
742.	Double Ruling Pen, 6½ in., to draw at one stroke either one broad line or two lines of equal or different thickness, ...	" 3 50
743.	Pricker, 2⅜ in., improved construction, ...	" 90
745.	Dotting Instrument with three wheels, in case, . . .	" 4 20
745½.	Circle Dotting Instrument with three wheels; is made to fit beam compasses No. 783; in case, ...	" 4 20

Additional wheels for Nos. 745 and 745½ can be furnished at 25 cents each.

For description of Instruments, see pages 68-71.

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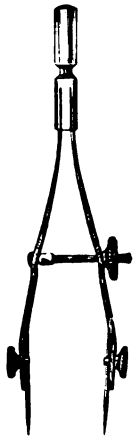
EXCELLO INSTRUMENTS OF PRECISION *Highest Grade*

Each Instrument stamped Ⓔ and **Excello.**
Illustrations ⅔ size.

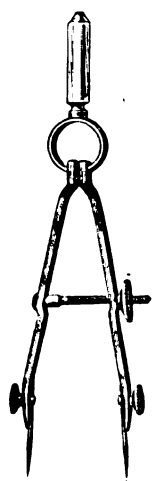


No. 746.

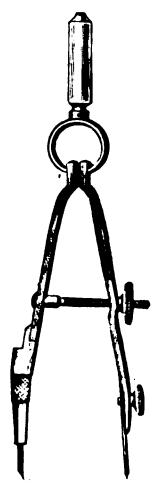
747.

748.

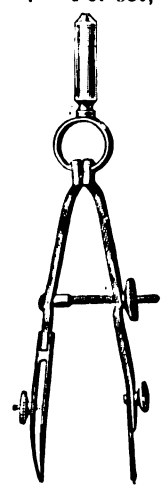
No 746.	Steel Spring Bow Dividers, 3½ in., metal handle,	Each,	$2 00
747.	" " " Pencil, 3½ " " "	"	2 40
748.	" " " Pen, 3½ " " "	"	2 60
749.	Set of Bows, Nos. 746, 747, 748, in case,	Per set,	8 20



No. 750A.



750B.



750C.

No. 750A.	Circular Steel Spring Bow Dividers, 3½ in., metal handle,		Each. $2 00
750B.	" " " " Pencil, 3½ " " "		2 40
750C.	" " " " Pen, 3½ " " "		2 60
750D.	Set of Bows, Nos. 750 A, 750B, 750C, in case,	Per set,	8 20
751A.	Circular Steel Spring Bow Dividers, 4½ in., metal handle,		2 40
751B.	" " " " Pencil, 4½ " " "		2 80
751C.	" " " " Pen, 4½ " " "		3 20
751D.	Set of Bows, Nos. 751A, 751B, 751C, in case,	Per set,	9 60

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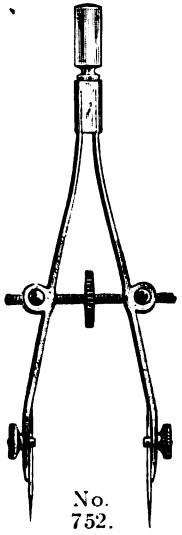
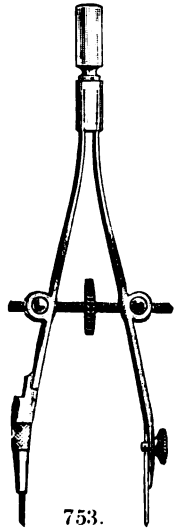
EXCELLO INSTRUMENTS OF PRECISION *Highest Grade*

Each Instrument stamped ⓔ and **Excello.**

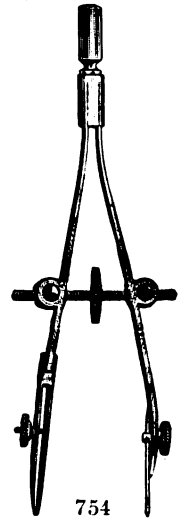
Illustrations ⅔ size.



No. 752.

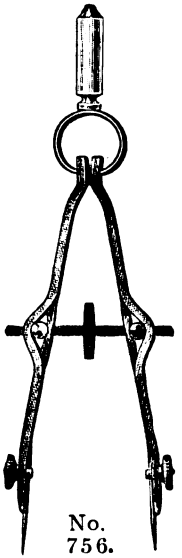


753.

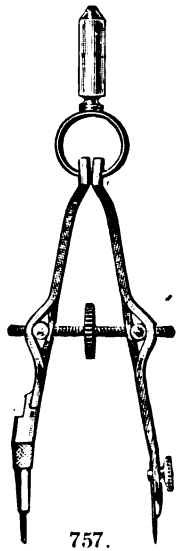


754

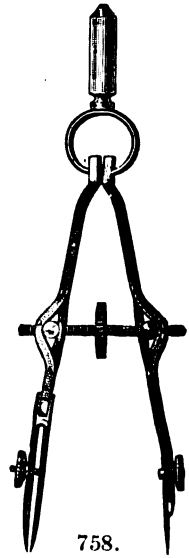
No. 752.	Steel Spring Bow Dividers, 3¾ in., metal handle,	Each, $3 00
753.	" " " Pencil, 3¾ " " "	" 3 30
754.	" " " Pen, 3¾ " " "	" 3 60
754½.	Set of Bows, Nos. 752, 753, 754, in case,	Per set, 11 20



No. 756.



757.



758.

No. 756.	Circular Steel Spring Bow Dividers, 4¼ in., metal handle,	Each, $3 00
757.	" " " " Pencil, 4¼ " " "	" 3 30
758.	" " " " Pen, 4¼ " " "	" 3 60
759.	Set of Bows, Nos. 756, 757, 758, in case,	Per set, 11 20

These Bows are easily regulated with one finger, by means of the little wheel which moves on a right and left thread.

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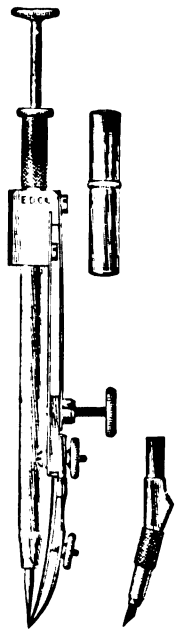
Of Cold Rolled German Silver and Best English Tool Steel.

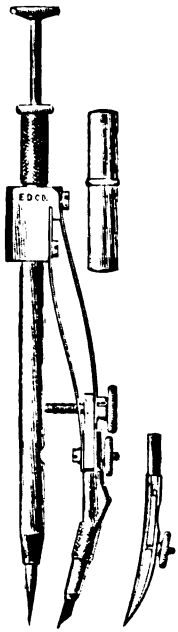
Each Instrument stamped (E) and **Excello.**

Illustrations ⅔ size.

No. 760.



761. (Closed.)



761. (Open.)

No. 760. Self-Adjusting Spring Bow Pen, 4½ in., ... Each, $3 75
761. " " " " with Pencil Point, 4½ in., " 5 00

Most suitable for small circles and superior to all other instruments of this kind as the two parallel springs shown in illustration hold the pen or pencil point in the same relative position regardless of the diameter of circle to be drawn.

A rod serving as handle and needle point passes through a hollow tube. While the rod remains stationary turn the screw head of tube without pressure, since pen and pencil draw by their own weight. Hold straight while turning.

For description of Instruments, see pages 68–71.

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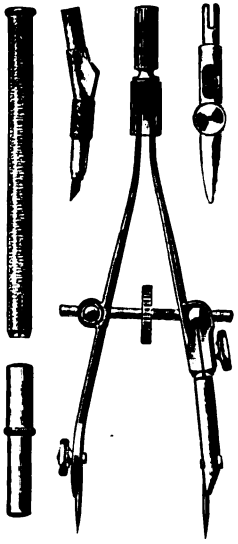
Each Instrument stamped Ⓔ and **Excello.**

Illustrations ½ size.



No. 763.

764.

No. 763. Steel Spring Bow Compasses, 3¾ in., with pen and pencil points, leadbox and handle to hold reserve needle points. The pen and pencil points can be used as Ruling Pen and Pencil respectively by inserting them into the handle, in case, ... **Each, $6 00**

764. Steel Spring Bow Compasses, 4 in., with pen and pencil points, leadbox and handle to hold reserve needle points. The pen and pencil points can be used as Ruling Pen and Pencil respectively by inserting them into the handle, in case, ... **Each, 6 00**

These combination instruments can be arranged to cover all ordinary work when the diameter of circle is 4 inches or less.

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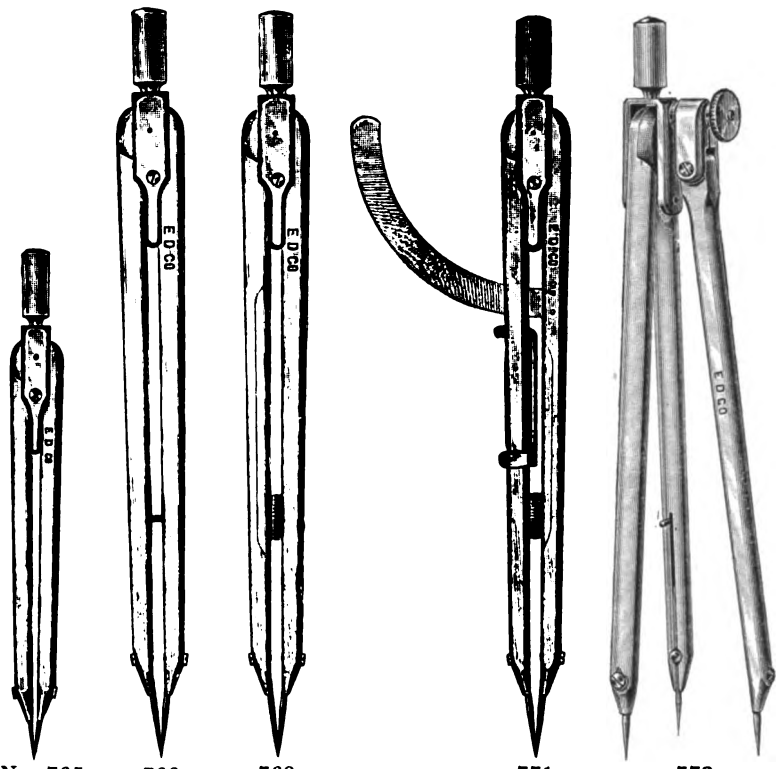
Of Cold Rolled German Silver and Best English Tool Steel.
Each Instrument stamped E.D.CO. and **Excello.**
Illustrations ⅛ size.



No. 765. 766. 769. 771. 773.

No. 765.	Plain Dividers, 4 in., with replaceable steel points, .	Each, $2 25
766.	" " 5¾ " " " " " .	" 2 70
767.	" " 6½ " " " " " .	" 3 00
768.	Hairspring Dividers, 4 in., with replaceable steel points,	" 3 20
769.	" " 5¾ " " " " " "	" 3 60
770.	" " 6½ " " " " " "	" 4 20
771.	" " 5¾ " with self-adjusting arc,	" 4 50
773.	Three-legged Dividers, 5½ in., with replaceable steel points,	" 5 00

Dividers Nos. 765 to 771 have Straightening Device.

For description of Instruments, see pages 68-71.

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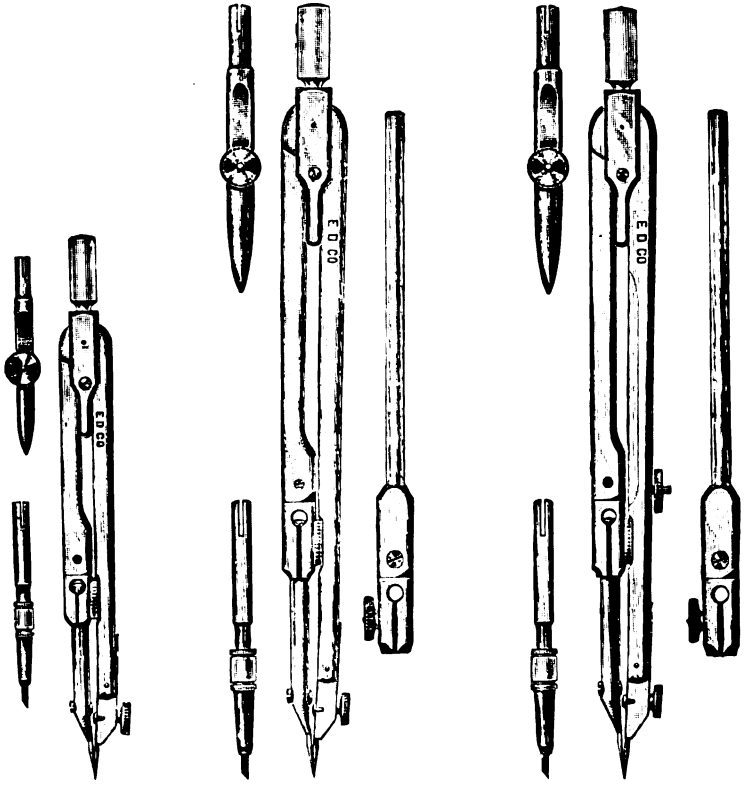
Of Cold Rolled German Silver and Best English Tool Steel.

Each Instrument stamped (E) and **Excello.**

Illustrations ⅞ size.



No. 775. 777. 779.

No. 775.	Compasses, 4 in., with replaceable needle points, pen and pencil points, straightening device, key and lead box, ...	Each,	$5 40
775C.	Compasses, 4 in., like No. 775, but with cross-joint pen,	"	6 00
776.	Compasses, 4 in., **hairspring,** with replaceable needle points, pen and pencil points and lengthening bar, straightening device, key and leadbox, ...	"	6 50
777.	Compasses, 6 in., with replaceable needle points, pen and pencil points and lengthening bar, straightening device, key and leadbox, ...	"	6 50
777C.	Compasses, 6 in., like No. 777, but with cross-joint pen,	"	7 20
778.	" 7 " otherwise same as No. 777, . .	"	7 80
779.	" 6 " **hairspring,** with replaceable needle points, pen and pencil points and lengthening bar, straightening device, key and leadbox, ...	"	7 50

Above Compasses fitted with our patent screw-thread needle points.

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EXCELLO INSTRUMENTS OF PRECISION *Highest Grade*

Of Cold Rolled German Silver and Best English Tool Steel.

Each Instrument stamped E.D.CO and **Excello.**

Illustrations ⅜ size.

782B.

No. 780. 781. 782A. 782C. 782D

No. 780. Compasses, 6 in., with self-adjusting arc, replaceable needle points, pen and pencil points, lengthening bar and straightening device, key and leadbox, . . . Each, $7 20

781. Compasses, 6 in., with reversible pen and pencil points and straightening device, key and leadbox, . . . " 5 25

782A. Combination Key and Leadbox, ... " 25

782B. Center Tack, ⅜ in. diameter, ... " 15

782C. Metal Handle, 2½ in., holding four needle points, . . . " 45

782D. " " 3 " " " " " " " " 50

These Handles fit the pen, pencil and needle parts of Compasses, any one of which can in connection with the handle be used as a separate instrument.

No. 782C is for Nos. 775-776 Compass parts, and No. 782D for Nos. 777-780 Compass parts.

Above Compasses fitted with our patent screw-thread needle points.

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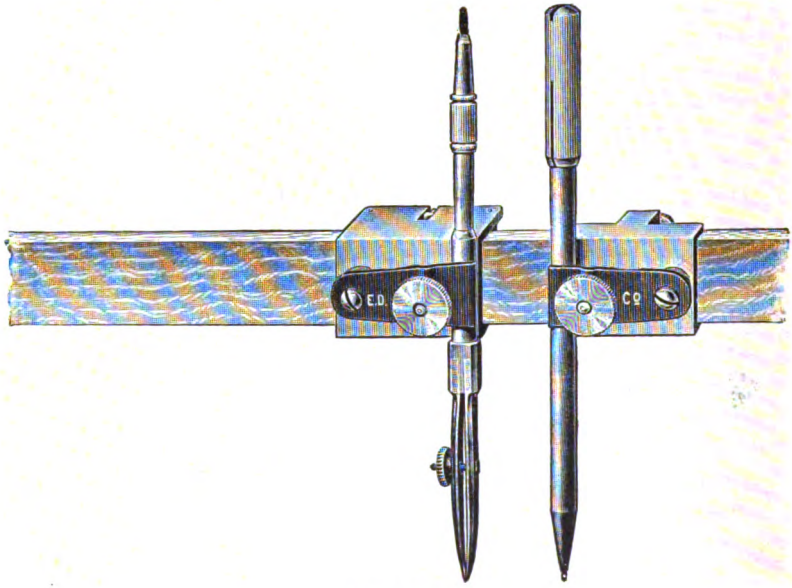
Of Cold Rolled German Silver and Best English Tool Steel.

Each Instrument stamped ℰ and **Excello.**



No. 783.

No. 783. Beam Compasses, in case, ... Each, $7 50

For Beam Compass Bars, see No. 2119.

These Beam Compasses differ from all others, principally in the fact that to set and adjust them no system of set screws, micrometer screws, etc., is needed. The movable compass holding the pen and pencil part is adjusted by means of a milled roller, which is held in contact with the bar by a strong steel spring, and is brought into any desired position by operating the roller with the finger.

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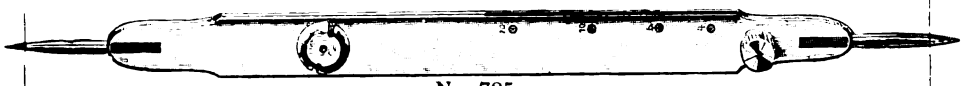


No. 785.

No. 787.

No. 785. Whole and Half Dividers, 7 in., with round solid steel points, for the following measurements, viz: $\frac{1}{8}$ and $\frac{1}{4}$ in.; $\frac{3}{8}$ and $\frac{3}{16}$ in.; $\frac{3}{8}$ and $\frac{3}{4}$ in.; $\frac{1}{2}$ and 1 in., in case, ... $ 6 60

787. Proportional Dividers, 7½ in., for lines and circles, with adjusting pin for setting divisions, in case, ... 12 00

The construction of this instrument dispenses with the micrometer screw and permits of a quicker and at the same time reliable setting.

SEPARATE PARTS FOR EXCELLO INSTRUMENTS

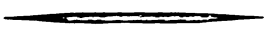
Illustrations full size.

A.

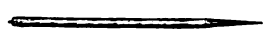
C.

E.

G.



B.



D.

CT.

DT.

F.

H.

No. 789A.	Plain Needle Points, small, ...	Each, $0 10
789B.	" " " large, ...	" 10
789C.	Combination Plain and Shoulder Needle Points, small,	" 15
789D.	" " " " " " large,	" 15
789CT.	Screw-thread Needle Points, small, ...	" 20
789DT.	" " " " large, ...	" 20
789E.	T Bolts, small, for Ruling Pens, etc., ...	" 15
789F.	" " large, for Compasses, ...	" 15
789G.	Thumb Nuts, small, ...	" 20
789H.	" " large, ...	" 20
789I.	Dotting Wheels for Nos. 745 and 745½, ...	" 25
789J.	Needle Point Holders for Large and Small Compasses,	" 90
789K	Pencil Points for Large and Small Compasses, . .	" 90
789L.	Pen Points for Large and Small Compasses, . . .	" 1 20
789M.	Pen Points with Cross Joint for Large and Small Compasses, ...	" 1 75
789R.	Lengthening Bar for Compasses Nos. 775–776, .	" 90
789S.	" " " " " 777–780, .	" 90

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EXCELLO INSTRUMENTS OF PRECISION

IN POCKET BOOK STYLE CASES, LINED WITH SILK VELVET.

The Highest Grade of Instruments.

Each Instrument stamped (E) and **Excello.**

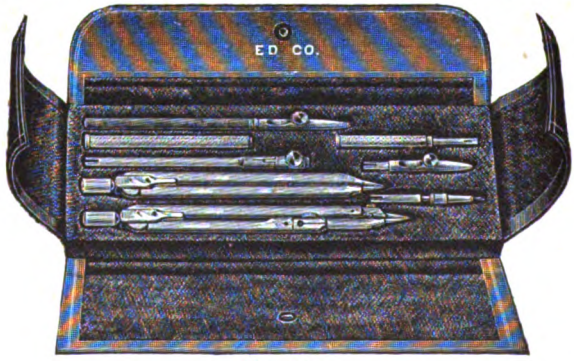
For description, see pages 68-71.

No. 790.

No. 790. Cont'g:

No. 725 Ruling Pen, 4½ in., metal handle.
765 Plain Dividers, 4 in., with replaceable steel points.
775 Compasses, 4 in., with replaceable needle points, pen and pencil points, straightening device.
782A Combination Key and Lead Box.
782C Metal Handle, 2½ in., with four needle points.

Per set, ... **$10 50**



No. 791.

No. 791. Cont'g:

No. 726 Ruling Pen, 5 in., metal handle.
766 Plain Dividers, 5¾ in., with replaceable steel points.
777 Compasses, 6 in., with replaceable needle points, pen and pencil points, lengthening bar and straightening device.
782A Combination Key and Lead Box.
782D Metal Handle, 3 in., with four needle points.

Per set, ... **$12 60**

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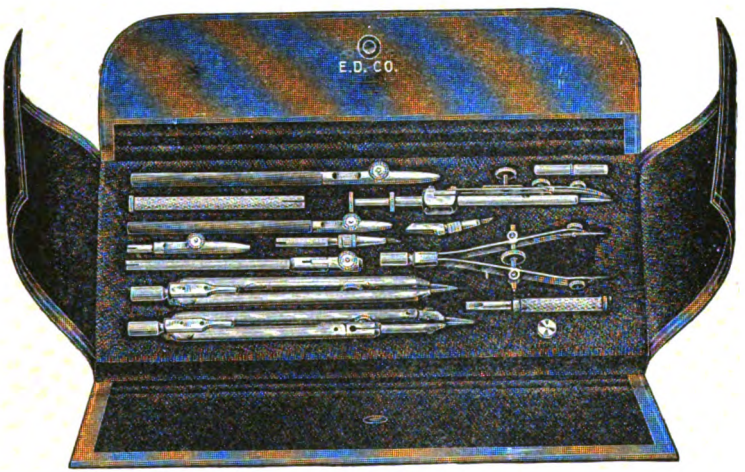
EXCELLO INSTRUMENTS OF PRECISION *Highest Grade*

IN CASES

Each Instrument stamped (E) and **Excello.**



No. 792.

No. 792. Cont'g:

No. 725 Ruling Pen, 4½ in., metal handle.
727 " " 5½ " " "
752 Steel Spring Bow Dividers, 3¾ in., metal handle.
761 Self-Adjusting Spring Bow Pen, with Pencil Point, 4½ in.
769 Hairspring Dividers, 5¾ in., with replaceable steel points.
777 Compasses, 6 in., with replaceable needle points, pen and pencil points, lengthening bar and straightening device.
782A Combination Key and Lead Box.
782B Center Tack, ⅜ in. diameter.
782D Metal Handle, 3 in., with four needle points.

Per set, ... $23 50

No. 792½. Containing the same as No. 792, but with the addition of No. 775 Compasses, 4 in.

Per set, ... $29 50

For description of Instruments, see pages 68-71.

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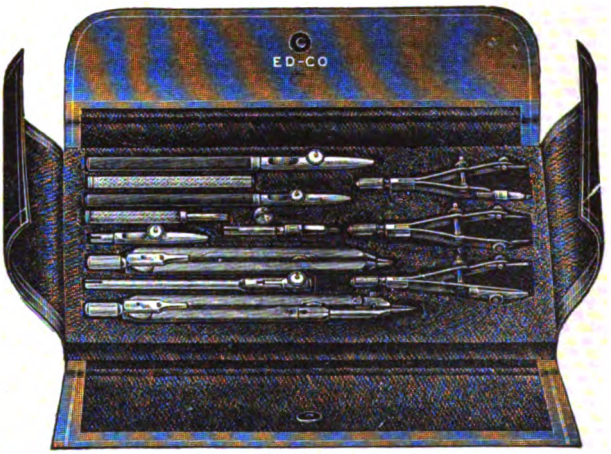
EXCELLO INSTRUMENTS OF PRECISION *Highest Grade*

IN CASES

Each Instrument stamped ED and **Excello.**



No. 793.

No. 793. Cont'g:

No. 725 Ruling Pen, 4½ in., metal handle.

727 " " 5½ " " "

746 Steel Spring Bow Dividers, 3½ in., metal handle.

747 " " " Pencil, 3½ " " "

748 " " " Pen, 3½ " " "

769 Hairspring Dividers, 5¾ in., with replaceable steel points.

777 Compasses, 6 in., with replaceable needle points, pen and pencil points, lengthening bar and straightening device.

782A Combination Key and Lead Box.

782B Center Tack, ⅜ in. diameter.

782D Metal Handle, 3 in., with four needle points.

Per set, ... $23 50

No. 793H. Containing the same as No. 793, but with Hairspring Compasses No. 779 in place of No. 777.

Per set, ... $24 50

For description of Instruments, see pages 68-71.

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EXCELLO INSTRUMENTS OF PRECISION *Highest Grade*

IN CASES

Each Instrument stamped ED-CO and **Excello.**

No. 795.

No. 795. Cont'g:

No. 725 Ruling Pen, 4½ in., metal handle.
727 " " 5½ " " "
750A Circular Steel Spring Bow Dividers, 3½ in., metal handle.
750B Circular Steel Spring Bow Pencil, 3½ in., metal handle.
750C Circular Steel Spring Bow Pen, 3½ in., metal handle.
769 Hairspring Dividers, 5¾ in., with replaceable steel points.
777 Compasses, 6 in., with replaceable needle points, pen and pencil points, lengthening bar and straightening device.
782A Combination Key and Lead Box.
782B Center Tack, ⅜ in. diameter.
782D Metal Handle, 3 in., with four needle points.
Per set, ... $23 50

No. 795H. Containing the same as No. 795, but with Hairspring Compasses No. 779 in place of No. 777.
Per set, ... $24 50

No. 795L. Containing the same as No. 795, but with 4¼ in. Bows, Nos. 751A, 751B, 751C, in place of Nos. 750A, 750B, 750C.
Per set, ... $25 00

For description of Instruments, see pages 68-71.

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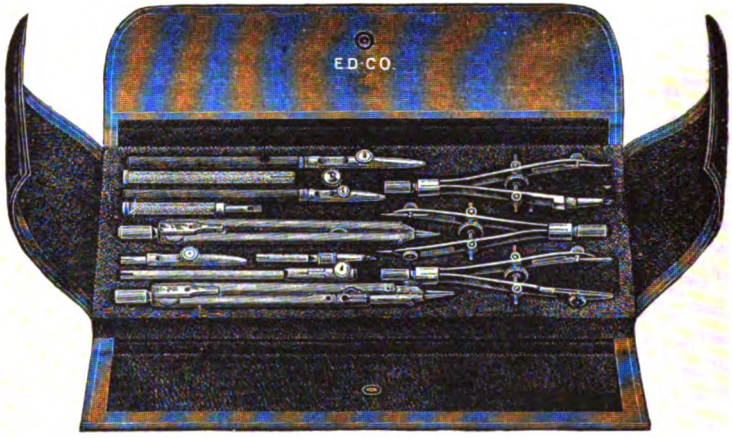
EXCELLO INSTRUMENTS OF PRECISION *Highest Grade*

IN CASES

Each Instrument stamped E.D.CO. and **Excello.**



No. 796.

No. 796. Cont'g:

No. 725 Ruling Pen, 4½ in., metal handle.

727 " " 5½ " " "

752 Steel Spring Bow Dividers, 3¾ in., metal handle.

753 " " " Pencil, 3¾ " " "

754 " " " Pen, 3¾ " " "

769 Hairspring Dividers, 5¾ in., with replaceable steel points.

777 Compasses, 6 in., with replaceable needle points, pen and pencil points, lengthening bar and straightening device.

782A Combination Key and Lead Box.

782B Center Tack, ⅜ in. diameter.

782D Metal Handle, 3 in., with four needle points.

Per set, ... $26 00

No. 796H. Containing the same as No. 796, but with Hairspring Compasses No. 779 in place of No. 777.

Per set, ... $27 00

No. 796L. Containing the same as No. 796, but with Bows Nos. 756, 757, 758 in place of Nos. 752, 753, 754. Per set, . . $26 00

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EXCELLO INSTRUMENTS OF PRECISION *Highest Grade*

IN CASES

Each Instrument stamped ED-CO and **Excello.**

No. 797.

No. 797. Cont'g:

No. 726 Ruling Pen, 5 in., metal handle.
740 Swedish Ruling Pen, 6 in., flat metal handle.
746 Steel Spring Bow Dividers, 3½ in., metal handle.
747 " " " Pencil, 3½ " " "
748 " " " Pen, 3½ " " "
769 Hairspring Dividers, 5¾ in., with replaceable steel points.
775 Compasses, 4 in., with replaceable needle points, pen and pencil points, and straightening device.
777 Compasses, 6 in., with replaceable needle points, pen and pencil points, lengthening bar and straightening device.
782A Combination Key and Lead Box.
782B Center Tack, ⅜ in., diameter.
782C Metal Handle, 2½ in., with four needle points.
782D. " " 3 " " " " "
Per set, ... $29 00

No. 797H. Containing the same as No. 797, but with Hairspring Compasses No. 779 in place of No. 777.
Per set, ... $30 00

For description of Instruments, see pages 68-71.

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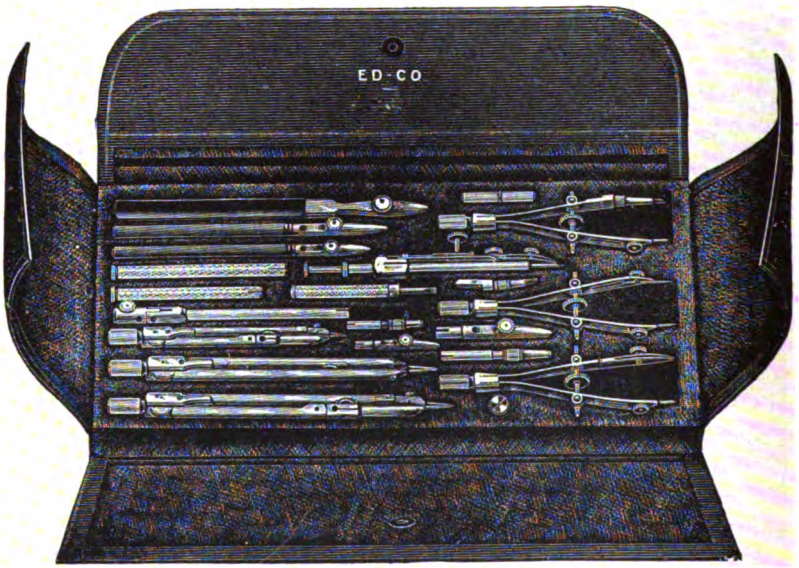
EXCELLO INSTRUMENTS OF PRECISION *Highest Grade*

IN CASES

Each Instrument stamped ED-CO and **Excello.**



No. 797K.

No. 797K. Cont'g:

No. 725 Ruling Pen, 4½ in., metal handle.
726 " " 5 " " "
739 Swedish Ruling Pen, 6 in., metal handle.
752 Steel Spring Bow Dividers, 3¾ in., metal handle.
753 " " " Pencil, 3¾ " " " "
754 " " " Pen, 3¾ " " " "
761 Self-Adjusting Spring Bow Pen and Pencil Point, 4½ in.
769 Hairspring Dividers, 5¾ in., with replaceable steel points.
775 Compasses, 4 in., with replaceable needle points, pen and pencil points and straightening device.
777 Compasses, 6 in., with replaceable needle points, pen and pencil points, lengthening bar and straightening device.
782A Combination Key and Lead Box.
782B Center Tack, ⅜ in., diameter.
782C Metal Handle, 2½ in., with four needle points.
782D " " 3 " " " " " "
Per set, ... $38 00

No. 797L. Containing the same as No. 797K, but with Hairspring Compasses No. 779 in place of No. 777.
Per set, ... $39 00

For description of Instruments, see pages 68-71.

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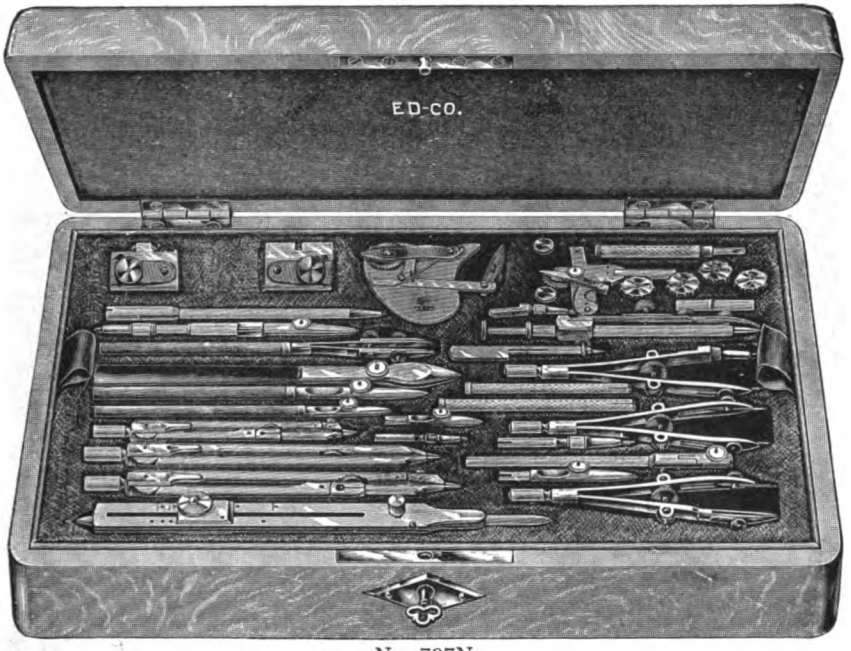
EXCELLO INSTRUMENTS OF PRECISION *Highest Grade*

Each Instrument stamped Ⓔ and **Excello.**



No. 797N.

No. 797N. In fine polished hardwood case, with lock and tray—Cont'g:

No. 725 Ruling Pen, 4½ in., metal handle.
727 " " 5½ " " "
736 Railroad Pen, 5¼ in., " "
740 Swedish Ruling Pen, 6 in., metal handle.
743 Pricker, 2⅜ in.
745 Dotting Instrument with three wheels.
745½ Circle Dotting Instrument with three wheels.
752 Steel Spring Bow Dividers, 3¾ in., metal handle.
753 " " " Pencil, 3¾ " " "
754 " " " Pen, 3¾ " " "
761 Self-Adjusting Spring Bow Pen and Pencil Point, 4½ in.
769 Hairspring Dividers, 5¾ in., with replaceable steel points.
775 Compasses, 4 in., with replaceable needle points, pen and pencil points and straightening device.
777 Compasses, 6 in., with replaceable needle points, pen and pencil points, lengthening bar and straightening device.
782A Combination Key and Lead Box.
782B 2 Center Tacks, ⅜ in., diameter.
782C Metal Handle, 2½ in., with four needle points.
782D " " 3 " " " " " "
783 Beam Compasses.
787 Proportional Dividers, 7¼ in.

Per set, ... **$75 00**

Any other assortments fitted up to order at short notice.

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PREMIER INSTRUMENTS

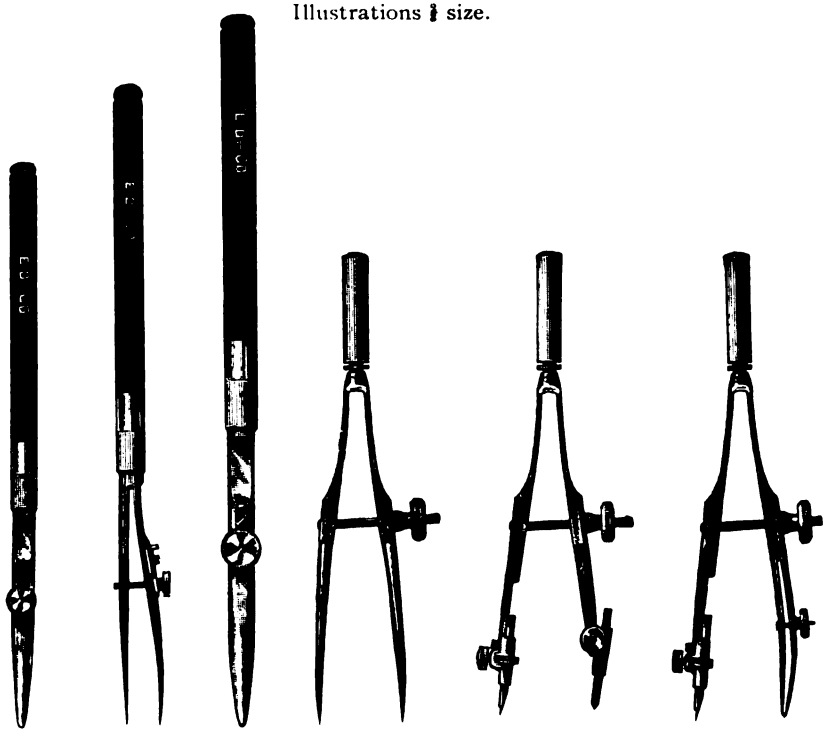
High Grade.

Of High Grade Rolled German Silver and Tool Steel.

Each Instrument stamped (E) and with quality mark (A).

For description of quality see page 71.

Illustrations ⅔ size.



No.798A. 798B. 798C. 798D. 798E. 798F.

No. 798A.	Ruling Pen, 4½ in., with slide-catch, ebony handle,	Each,	$0 90
798B.	" " 5 " " " " " "	"	1 00
798C.	" " 5½ " " " " " "	"	1 15
798D.	Steel Spring Bow Dividers, 3½ in., metal handle,	"	1 40
798E.	" " " Pencil, 3½ " " " . .	"	1 75
798F.	" " " Pen, 3½ " " " . .	"	1 75

By means of slide on upper blade, Ruling Pens Nos. 798A-798C may be opened for cleaning and closed again without changing adjustment for width of lines. These Pens differ slightly from our Slide-Catch Ruling Pens listed under Nos. 510-512, and are made by us to meet the demand for an improved pen at a moderate price.

Above Bow Pencils and Bow Pens fitted with our patent screw-thread needle points.

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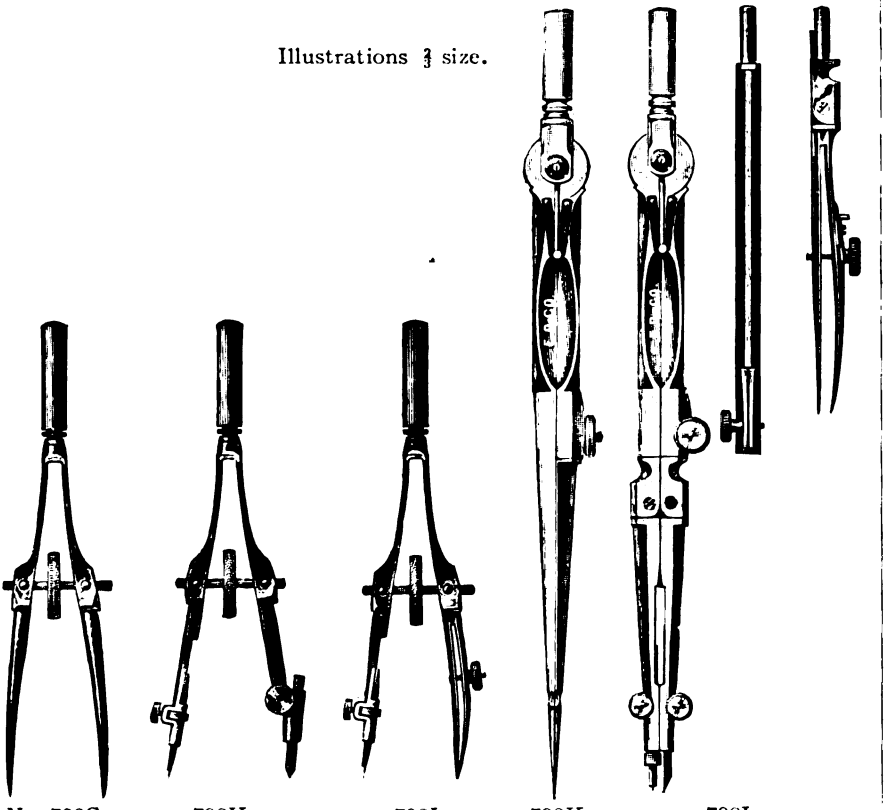
PREMIER INSTRUMENTS

High Grade

Of High Grade Rolled German Silver and Tool Steel.

Each Instrument stamped (E.D.Co.) and with quality mark (A).

Illustrations ⅔ size.



No. 798G. 798H. 798I. 798K. 798L.

No. 798G.	Steel Spring Bow Dividers, 3½ in., metal handle, .	Each,	$1 80
798H.	" " " Pencil, 3½ " " " .	"	2 25
798I.	" " " Pen, 3½ " " " .	"	2 25
798K.	Hairspring Dividers, 6 in., with straightening device,	"	3 25
798L.	Compasses, 6 in., with fixed needle point, slide-catch pen, pencil point, lengthening bar and straightening device, ...	"	6 00
798M.	Compasses, 6 in., **Hairspring,** with fixed needle point, slide-catch pen, pencil point, lengthening bar and straightening device, ...	"	6 75

Compasses, Bow Pencils and Bow Pens fitted with our patent screw-thread needle points. Patented Dec. 26, 1899.

For description of Instruments, see page 71.

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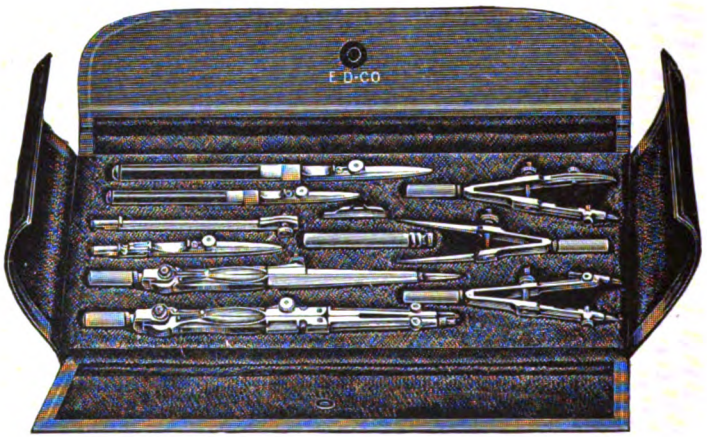
PREMIER INSTRUMENTS IN CASES *High Grade*

Of High Grade Rolled German Silver and Tool Steel.

For description of quality, see page 71.



No. 799A.

No. 799A. Pocket Book Case, silk velvet lined. Cont'g:
No. 798A Ruling Pen, 4¼ in., with slide catch and ebony handle.
798C Ruling Pen, 5½ in., with slide catch and ebony handle.
798D Steel Spring Bow Dividers, 3½ in., metal handle.
798E " " " Pencil, 3½ " " "
798F " " " Pen, 3½ " " "
798K Hairspring Dividers, 6 in., with straightening device.
798L Compasses, 6 in., with fixed needle point, slide-catch pen, pencil point, lengthening bar and straightening device.
Box with Leads. Per set, ... $18 00

No. 799B. Containing same assortment as No. 799A, but in Pocket Book Case, **chamois lined**.
Per set, ... $18 50

No. 799C. Containing same assortment as No. 799A, but with Hair-spring Compasses No. 798M in place of No. 798L, in Pocket Book Case, silk velvet lined.
Per set, ... $18 75

Above sets with center wheel Bows Nos. 798G, 798H and 798I, in place of Nos. 798D, 798E and 798F, add $1 40 per set.

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PREMIER INSTRUMENTS IN CASES *High Grade*

Of High Grade Rolled German Silver and Tool Steel.

For description of quality, see page 71.

No. 799D.

No. 799D. Pocket Book Case, silk velvet lined, cont'g:

No. 798B Ruling Pen, 5 in., with slide-catch and ebony handle.
837 Swedish Detail Pen, 6 in., ebony handle.
798D Steel Spring Bow Dividers, 3½ in., metal handle.
798E " " " Pencil, 3½ " " "
798F " " " Pen, 3½ " " "
798K Hairspring Dividers, 6 in., with straightening device.
798M Compasses, 6 in., hairspring, with fixed needle point, slide-catch pen, pencil point, lengthening bar and straightening device.

Box with Leads. Per set, ... $18 75

No. 799E. Containing the same assortment as No. 799D, but having Compasses No. 798L in place of No. 798M.

Per set, ... $18 00

Above sets with center wheel Bows Nos. 798G, 798H and 798I, in place of Nos. 798D, 798E and 798F, add $1 40 per set.

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SUPERIOR INSTRUMENTS

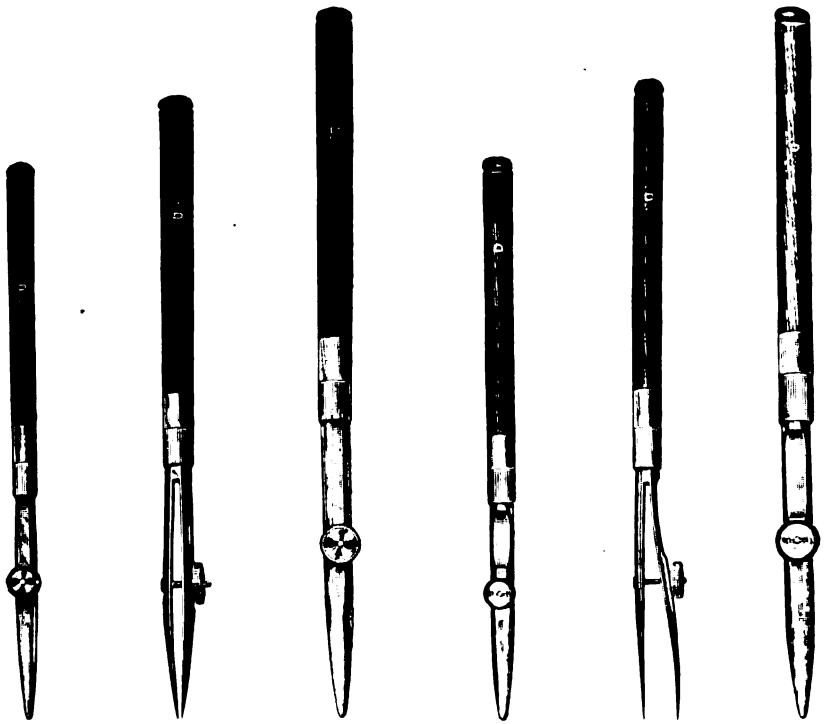
The Second Best Grade of Instruments.

Of Rolled German Silver and Steel.

Each Instrument stamped Ⓔ and with quality mark Ⓢ.

For description of quality, see page 72.

Illustrations ⅜ size.



No. 800. 801. 802. 806. 807. 808.

No. 800.	Ruling Pen, 4¼ in., ebony handle,	. . . . .	Each, $0 40
801.	" " 5 " " "	. . . . .	" 45
802.	" " 5½ " " "	. . . . .	" 48
806.	" " 4¼ " " " upper blade with spring,		" 60
807.	" " 5 " " "	" " " " "	" 66
808.	" " 5½ " " "	" " " " "	" 72

Pens carefully dressed and sharpened, each 20 to 25 cents.

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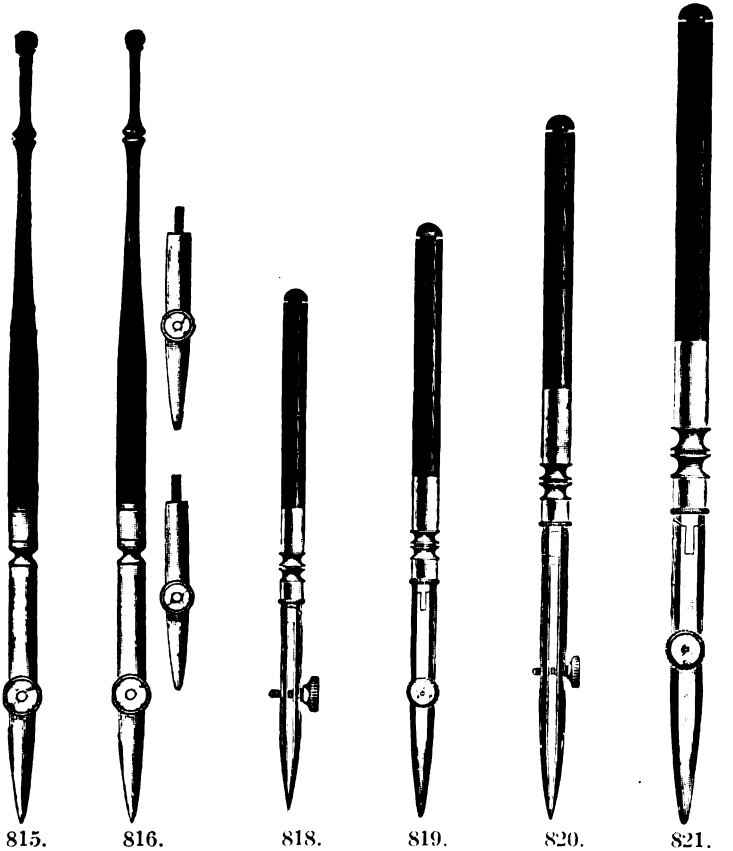
SUPERIOR INSTRUMENTS

Second Best Grade

Of Rolled German Silver and Steel.

Each Instrument stamped Ⓔ and with quality mark Ⓢ.

Illustrations ⅜ size.



No. 815. 816. 818. 819. 820. 821.

No. 815.	Hatching Pen, 6 in., extra fine, with pushing screw,	Each,	$0 84
816.	" " 6 " " " " " " 3 pens to handle,	"	1 65
818.	Ruling Pen, 4 in., ebony handle, improved joint,	"	84
819.	" " 4¾ " " " with pin and imp. joint,	"	93
820.	" " 5½ " " " " " " " "	"	1 00
821.	" " 6½ " " " " " " " "	"	1 10
822.	" " 5½ " " " " " " " " with German silver blades, for colored inks,	"	1 00

If desired, we furnish aluminum handles in place of ebony handles for Nos. 818-822 at 10 cents each, additional.

Pens carefully dressed and sharpened, each 20 to 25 cents.

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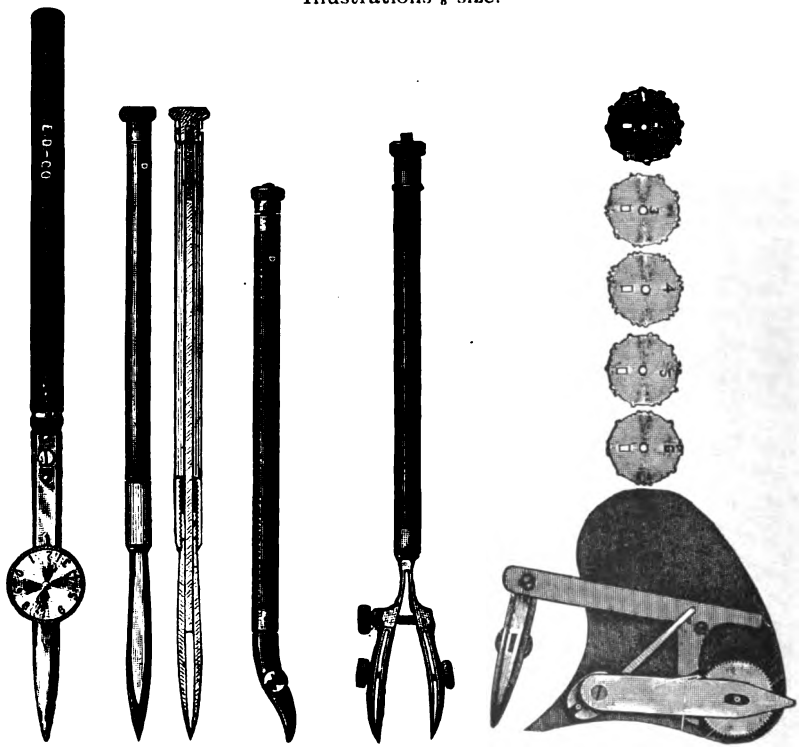
SUPERIOR INSTRUMENTS

Second Best Grade

Of Rolled German Silver and Steel.

Each Instrument stamped (E) and with quality mark (S).

Illustrations ⅜ size.



No. 825. 830. 832. 834. 835.

No. 825. Ruling Pen, 5½ in., with graduated thumbscrew, . Each, $1 80

For setting blades to any desired width by the numbers on the screw, when lines of certain even thickness are wanted.

830. Ruling Pen, 5¼ in., which opens and closes by turning thumbscrew at upper end of handle, ... " 1 50

832. Curve Pen, 4¾ in., blades fastened to a rod in a hollow handle, with screw at upper end, to set pen firm or loose to follow smallest curve with precision, . . " 1 50

834. Railroad Pen, 5¼ in. The pens are fastened to a rod in a hollow handle, with screw at upper end to set pens firm for straight lines, or loose to follow curved lines, " 4 25

835. Dotting Instrument, with six wheels in case, . . " 4 50

By throwing back the spring the wheels of different patterns are inserted. The wheel is rolled on the edge of a T square or straight edge and causes the pen by means of a ratchet wheel to move up and down. Dotting instruments for circles, see No. 922.

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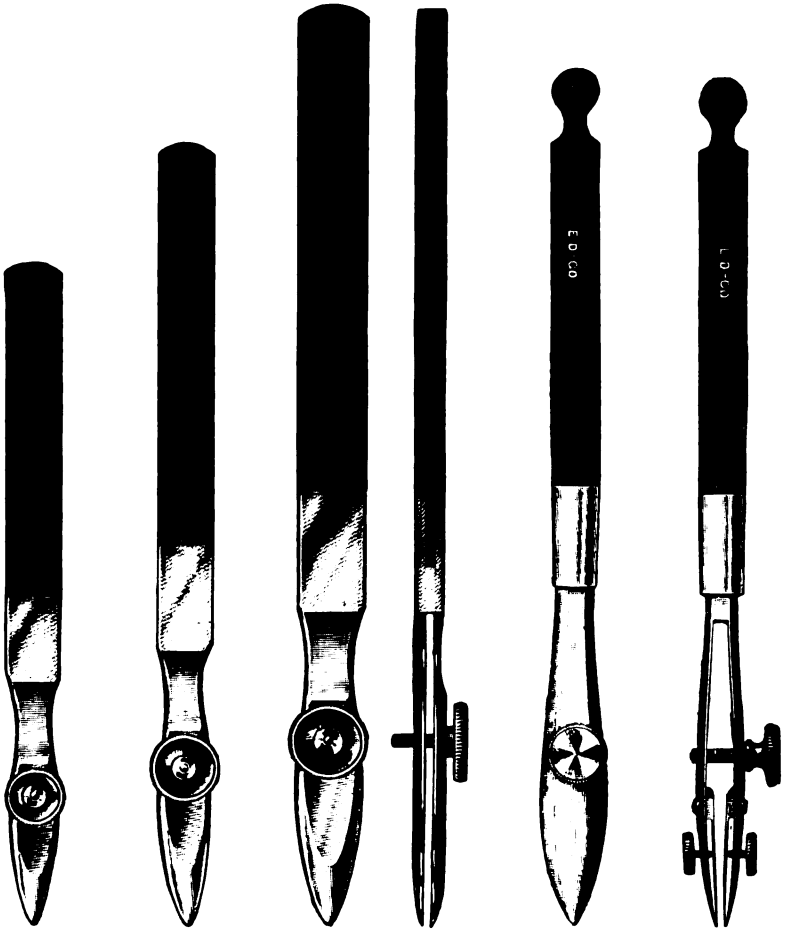
SUPERIOR INSTRUMENTS

Second Best Grade

Of Rolled German Silver and Steel.

Each Instrument stamped (E) and with quality mark (S).

Illustrations ⅓ size.



No. 836. 837. 838. 843. 845.

No. 836.	Swedish Detail Ruling Pen, 5 in., ebony handle, upper blade with spring, for long lines, ...	Each,	$0 90
837.	Swedish Detail Ruling Pen, 6 in., ebony handle, upper blade with spring, for long lines, ...	"	1 05
838.	Swedish Detail Ruling Pen, 7 in., ebony handle, upper blade with spring, for long lines, ...	"	1 20
843.	Detail Pen, 6½ in., round ebony handle, ...	"	1 00
845.	" " 6½ " " " " for double lines,	"	2 00

These Pens are adapted for drawing long and heavy lines, and being made to hold much ink, do not require very frequent filling.

Pens carefully dressed and sharpened, each 20 to 25 cents.

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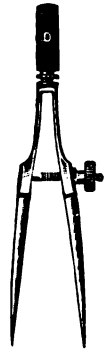
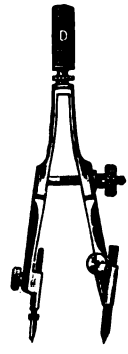
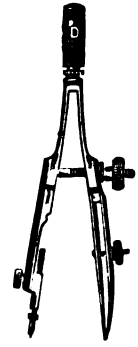
SUPERIOR INSTRUMENTS

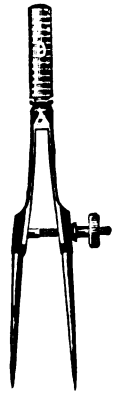
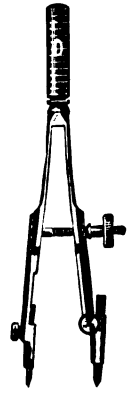
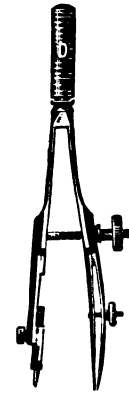
Second Best Grade

Of Rolled German Silver and Steel.
Each Instrument stamped (E) and with quality mark (S).
Illustrations ⅔ size.

No. 850. 851. 852.

No. 850.	Minute Steel Spring Bow Dividers, 2½ in., metal handle, Each,	$1 00
851.	" " " " Pencil, 2½ " " " " "	1 35
852.	" " " " Pen, 2½ " " " " "	1 35
853.	Set of Bows, Nos. 850, 851, 852, in morocco case, . Per set,	4 35

No. 855. 856. 857.

No. 855.	Steel Spring Bow Dividers, 3 in., metal handle, . . Each,	$1 05
856.	" " " Pencil, 3 " " " . . "	1 40
857.	" " " Pen, 3 " " " . . "	1 40
858.	Set of Bows, Nos. 855, 856, 857, in morocco case, . Per set,	4 60

Above Bow Pencils and Bow Pens fitted with our patent screw-thread needle points. Patented Dec. 26, 1899.

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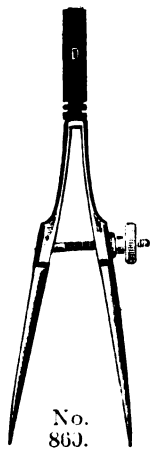
SUPERIOR INSTRUMENTS

Second Best Grade

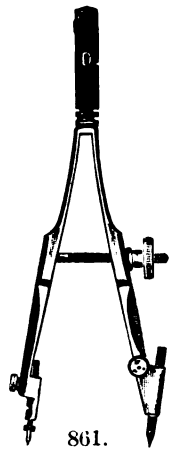
Of Rolled German Silver and Steel.

Each Instrument stamped (E) and with quality mark (S).

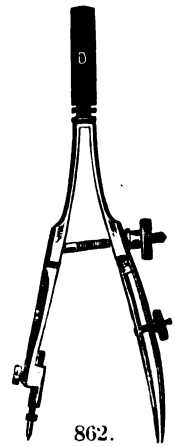
Illustrations ⅜ size.



No. 860.

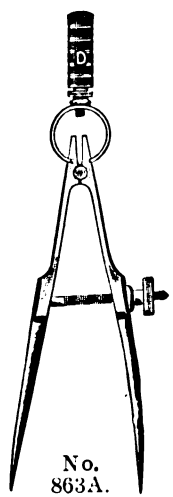


861.

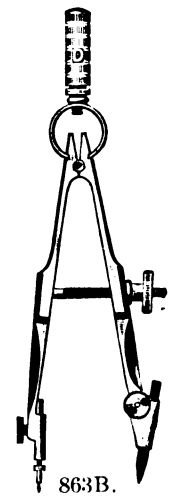


862.

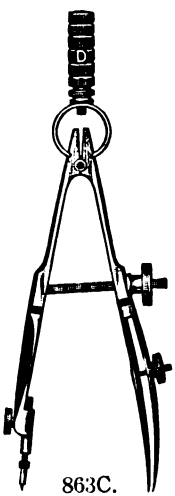
No. 860.	Steel Spring Bow Dividers, 3½ in., metal handle,	Each,	$1 08
861.	" " " Pencil, 3½ " " "	"	1 45
862.	" " " Pen, 3½ " " "	"	1 45
863.	Set of Bows, Nos. 860, 861, 862, in morocco case,	Per set,	4 65



No. 863A.



863B.



863C.

		Each.
No. 863A.	Circular Steel Spring Bow Dividers, 3½ in., metal handle,	$1 08
863B.	" " " " Pencil, 3½ " " "	1 45
863C.	" " " " Pen, 3½ " " "	1 45
863D.	Set of Bows, Nos. 863A, 863B, 863C, in morocco case, Per set,	4 65

Above Bow Pencils and Bow Pens fitted with our patent screw-thread needle points. Patented Dec. 26, 1899.

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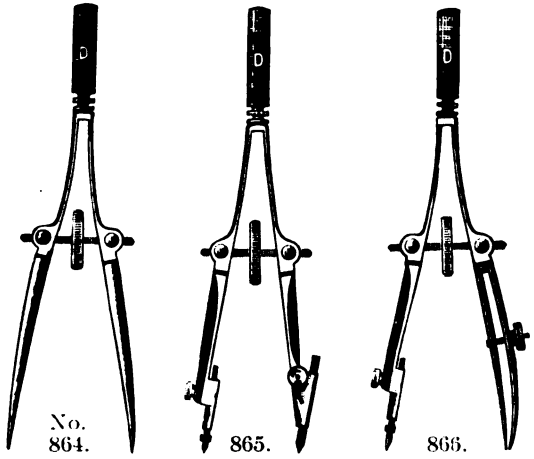
SUPERIOR INSTRUMENTS

Second Best Grade

Of Rolled German Silver and Steel.

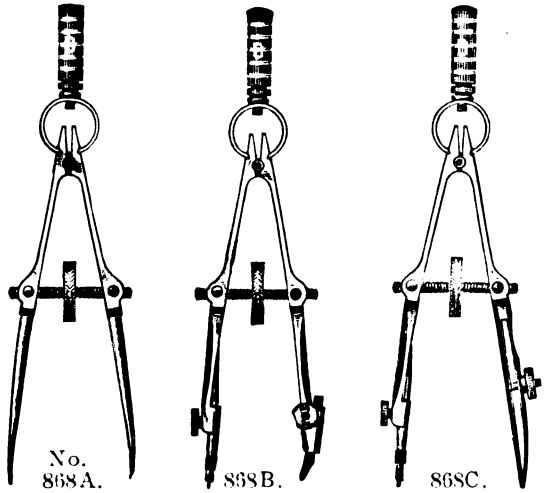
Each Instrument stamped (E) and with quality mark (S).

Illustrations ⅔ size.



No. 864. 865. 866.

No. 864.	Steel Spring Bow Dividers, 3½ in., metal handle,	Each, $1 65
865.	" " " Pencil, 3½ " " "	" 1 95
866.	" " " Pen, 3½ " " "	" 1 95
867.	Set of Bows, Nos. 864, 865, 866, in morocco case,	Per set, 6 60



No. 868A. 868B. 868C.

		Each.
No. 868A.	Circular Steel Spring Bow Dividers, 3½ in., metal handle,	$1 65
868B.	" " " " Pencil, 3½ " " "	1 95
868C.	" " " " Pen, 3½ " " "	1 95
868D.	Set of Bows, Nos. 868A, 868B, 868C, in morocco case, Per set,	6 60

Above Bows have a screw on a right-and-left thread, which holds the points firmly in any position. The Bow Pencils and Bow Pens are fitted with our patent screw-thread needle points.

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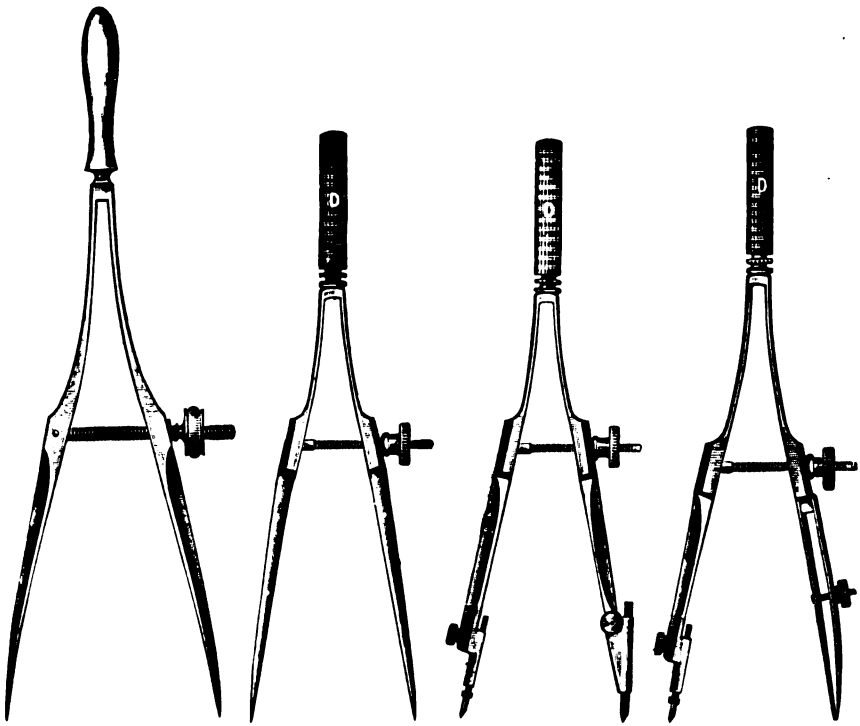
Of Rolled German Silver and Steel.

Each Instrument stamped (E) and with quality mark (S).

Illustrations ⅔ size.



No. 871. 872. 873. 874.

No. 871.	Large Steel Spring Dividers, 5¾ in., white handle, .	Each,	$2 25
872.	Steel Spring Bow Dividers, 4¾ in., metal handle, . .	"	1 85
873.	" " " Pencil, 4¾ " " " . .	"	2 10
874.	" " " Pen, 4¾ " " " . .	"	2 10
875.	Set of Bows, Nos. 872, 873, 874, in morocco case, .	Per set,	6 90

Above Bow Pencils and Bow Pens fitted with our patent screw-thread needle points.

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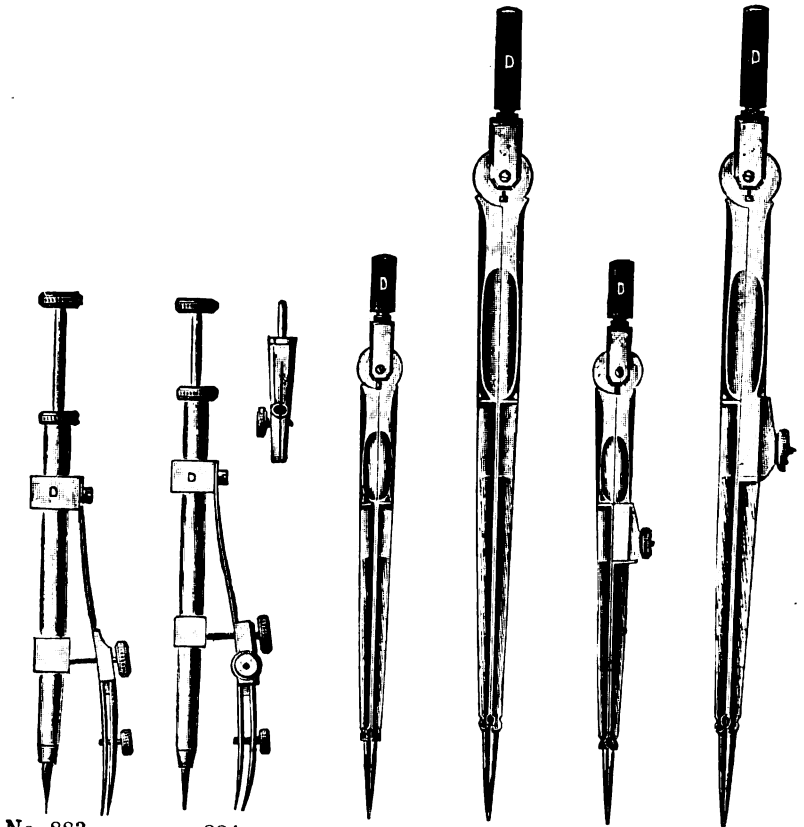
Of Rolled German Silver and Steel.

Each Instrument stamped (E) and with quality mark (S).

Illustrations ⅜ size.



No. 883. 884. 897. 898. 902. 903.

No. 883.	Spring Bow Pen, self-adjusting,		Each,	$1 80
884.	" " " " "	with pencil point,	"	3 00
897.	Plain Dividers,	4½ in., pivot joint,	"	1 35
898.	" "	6 " " "	"	1 50
899.	" "	7 " " "	"	1 80
902.	Hairspring Dividers,	4½ " " "	"	1 90
902½.	" "	4¾ " " "	"	2 10
903.	" "	6 " " "	"	2 25
903S.	" "	6 " " " with straightening device,	"	2 45
904.	" "	7 " " "	"	2 75

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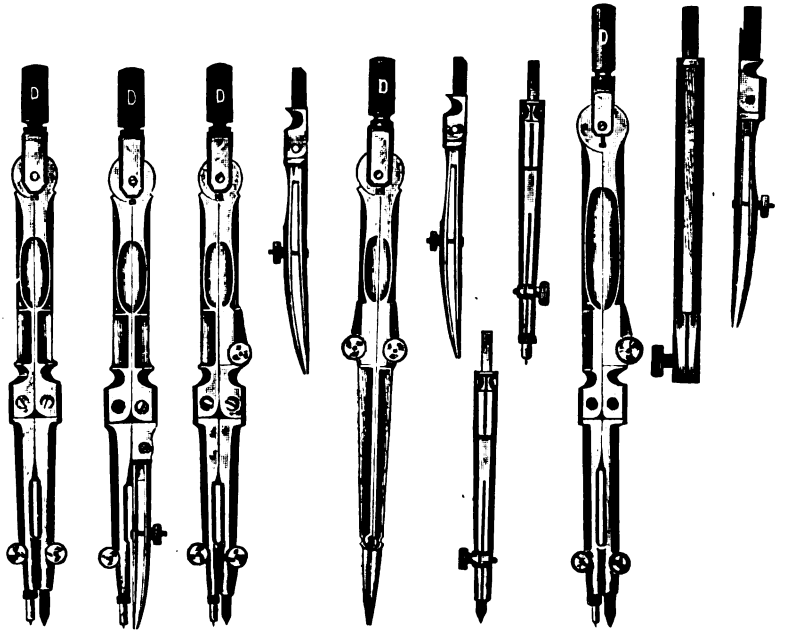
SUPERIOR INSTRUMENTS

Second Best Grade

Of Rolled German Silver and Steel.

Each Instrument stamped Ⓔ and with quality mark Ⓢ.

Illustrations ⅜ size.



No. 906. 907. 908. 910. 911.

No. 906.	Compasses, 4½ in., with fixed needle and pencil point, pivot joint, ...	Each,	$2 75
907.	Compasses, 4½ in., with fixed needle and pen point, pivot joint, ...	"	2 75
908.	Compasses, 4½ in., with fixed needle point, pen and pencil point, pivot joint, ...	"	3 60
910.	Compasses, 4½ in., with 2 steel points, pen, pencil and needle point, pivot joint, ...	"	4 20
911.	Compasses, 5 in., with fixed needle point, pen, pencil point and lengthening bar, pivot joint, ...	"	4 20

Above Compasses fitted with our patent screw-thread needle points. Patented Dec. 26, 1899.

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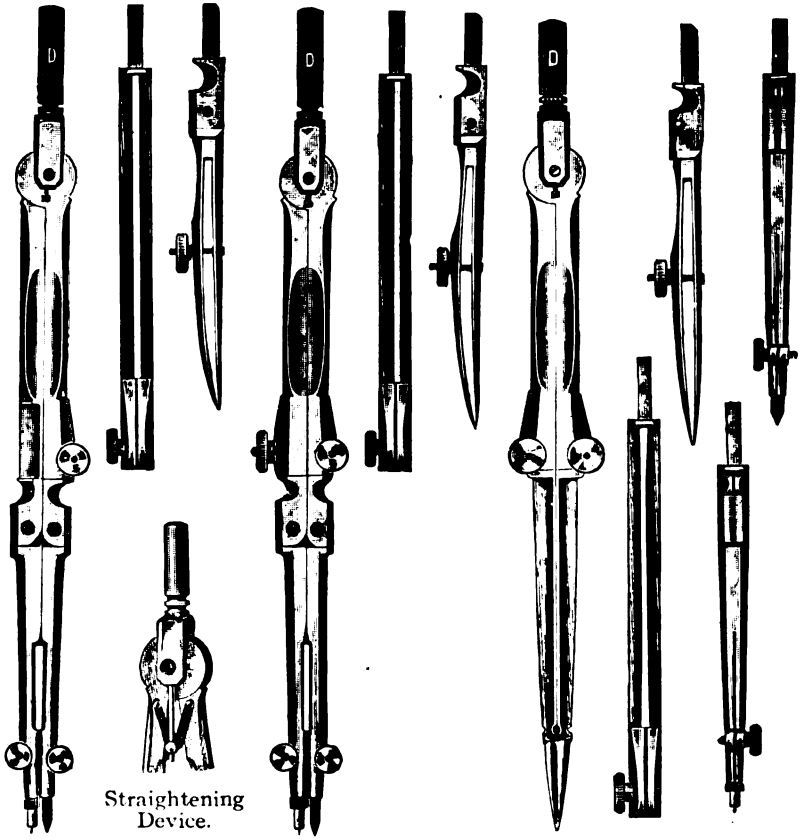
SUPERIOR INSTRUMENTS

Second Best Grade

Of Rolled German Silver and Steel.

Each Instrument stamped (E) and with quality mark (S).

Illustrations ¾ size.



Straightening Device.

No. 913. 914. 915.

No. 913.	Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar, pivot joint, ...	Each,	$4 35
913S.	Compasses like No. 913, but with straightening device,	"	4 55
914.	Compasses, 6 in., Hairspring, with fixed needle point, pen, pencil point and lengthening bar, pivot joint,	"	5 00
914S.	Compasses like No. 914, but with straightening device,	"	5 20
915.	Compasses, 6 in., with 2 steel points, pen, pencil and needle point and lengthening bar, pivot joint, . .	"	5 00

Above Compasses fitted with our patent screw-thread needle points. Patented Dec. 26, 1899.

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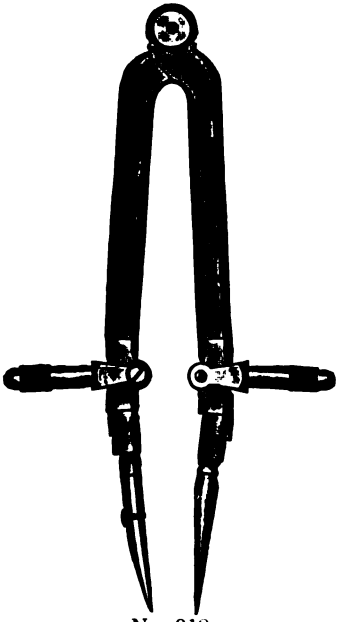
SUPERIOR INSTRUMENTS

Second Best Grade

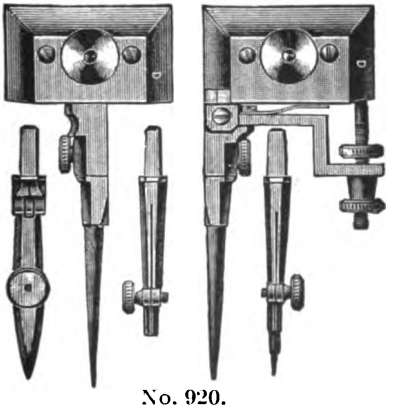
Of Rolled German Silver and Steel.
Illustrations ⅛ size.



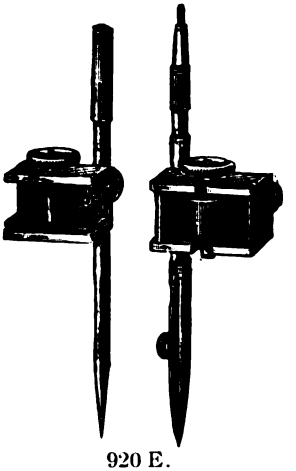
No. 918.

No. 918, folded. 918 Points, withdrawn.

No. 918. Pillar Pocket Compasses, with two steel points, pen and pencil points, which can be withdrawn from compasses to be used separately as bow pencil and bow pen, respectively; in case, . Each, $8 70



No. 920.



920 E.

No. 920. Beam Compasses, to fit on any straight edge, with two steel points, pencil, pen and needle point, and micrometer adjustment, ... Each, $6 90

920C. Beam Compasses, No. 920 in morocco pocket case, " 8 00

920E. Beam Compasses, with steel point, pen and pencil point, adjusted by means of a milled roller, . . " 6 80

920F. Beam Compasses, No. 920E in morocco pocket case, " 8 00

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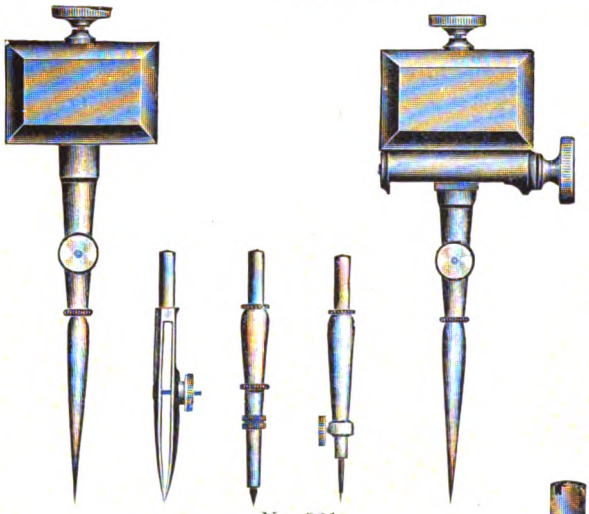
SUPERIOR INSTRUMENTS

Second Best Grade

Of Rolled German Silver and Steel.
Illustrations ⅜ size.



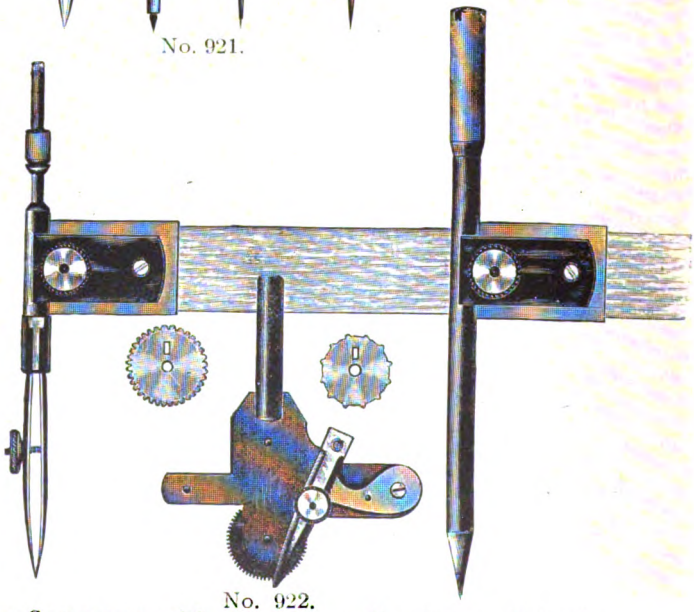
No. 921.

No. 921. Beam Compasses, with two steel points, pen, pencil and needle point, and micrometer adjustment.
Each, . . $7 40

No. 921C. Beam Compasses, No. 921, in morocco pocket case,
Each, . . $8 50

Pencil Point.

Pen Point.



No. 922.

No. 922. Beam Compasses, with pen and pencil points, and dotting instrument with three wheels of different patterns similar to No. 835. The dotting instrument can be used separately like No. 835 or in connection with Beam Compasses to draw dotted circles. Complete in case, ... Each, $9 90

For Beam Compass Bars see No. 2119.

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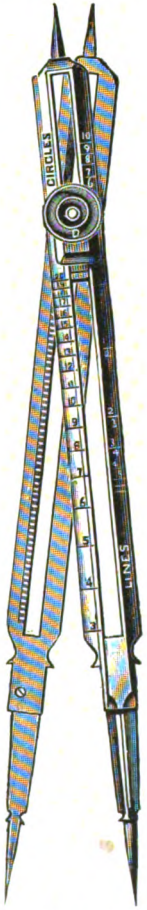
SUPERIOR INSTRUMENTS

Second Best Grade

Of Rolled German Silver and Steel.

Illustrations ⅔ size.

No. 924.



926.

928.

No. 924.	Proportional Dividers, 7¼ in., for lines and circles, in case,	Each,	$ 7 00
925.	Proportional Dividers, 9¼ in., for lines and circles, in case,	"	10 20
926.	Proportional Dividers, 7¼ in., with rack movement, for lines, circles, planes and solids, in case,	"	10 20
928.	Proportional Dividers, 9¼ in., with micrometer adjustment, for lines and circles, in case,	"	13 50

Nos. 924 to 928, without cases, cost $0.75 to $1.00 less.

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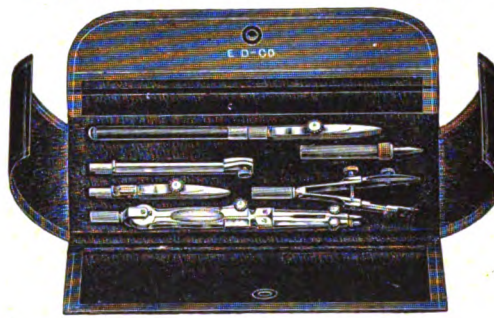
SUPERIOR INSTRUMENTS

IN POCKET BOOK STYLE CASES, LINED WITH SILK VELVET.

The Second Best Grade of Instruments.

Of Rolled German Silver and Steel.

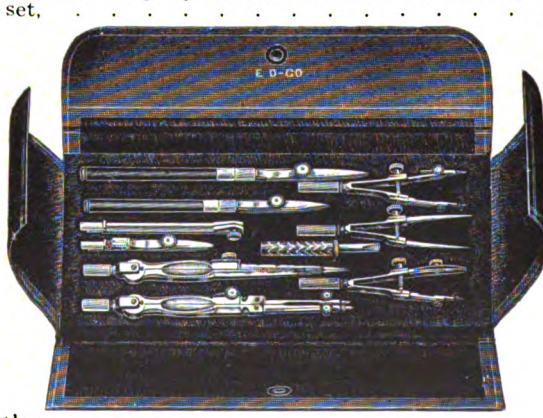
For description of quality see page 72.



No. 930.

No. 930. Cont'g:
No. 807 Ruling Pen, 5 in., with spring and ebony handle.
857 Steel Spring Bow Pen, 3 in., metal handle.
911 Compasses, 5 in., with fixed needle point, pen, pencil point and lengthening bar, pivot joint.
977 Combination Lead Box and Key.
Extra Needle Point for Compasses. Per set, . . $7 50

No. 931. Containing the same as No. 930, but including Hairspring Dividers No. 902½, 4¾ in., and without extra needle point.
Per set, ... 9 90



No. 933.

No. 933. Cont'g:
No. 806 Ruling Pen, 4¼ in., with spring and ebony handle.
807 " " 5 " " " " " " "
855 Steel Spring Bow Dividers, 3 in., metal handle.
856 " " " Pencil, 3 " " "
857 " " " Pen, 3 " " "
902½ Hairspring Dividers, 4¾ in., pivot joint.
911 Compasses, 5 in., with fixed needle point, pen, pencil point and lengthening bar, pivot joint.
977 Combination Lead Box and Key. Per set, . . . $12 50

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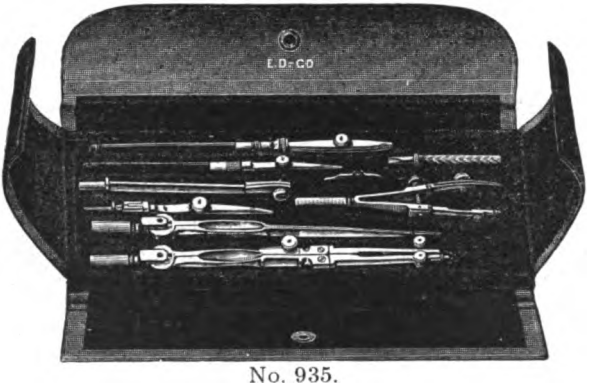
SUPERIOR INSTRUMENTS

Second Best Grade

IN CASES

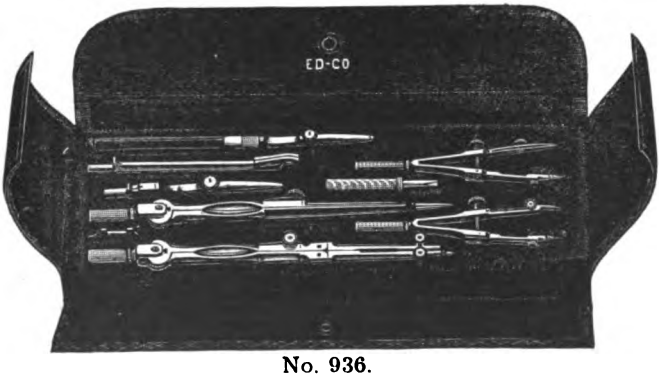
Each Instrument stamped (E) and with quality mark (S).



No. 935.

No. 935. Cont'g:

No. 806 Ruling Pen, 4½ in., with spring and ebony handle.
820 " " 5½ " " pin and joint, ebony handle.
862 Steel Spring Bow Pen, 3½ in., metal handle.
898 Plain Dividers, 6 in., pivot joint.
913 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar, pivot joint.
977 Combination Lead Box and Key. Per set, . . . **$9 60**



No. 936.

No. 936. Cont'g:

No. 808 Ruling Pen, 5½ in., with spring and ebony handle.
861 Steel Spring Bow Pencil, 3½ in., metal handle.
862 " " " Pen, 3½ " " "
903 Hairspring Dividers, 6 in., pivot joint.
913 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar, pivot joint.
977 Combination Lead Box and Key. Per set, . . **$11 70**

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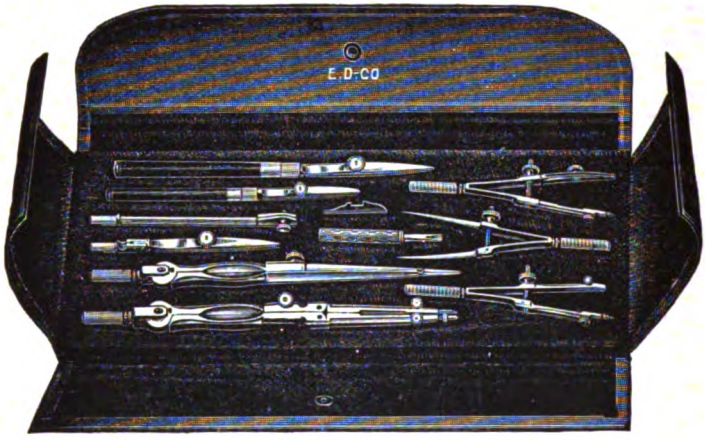
SUPERIOR INSTRUMENTS

Second Best Grade

IN CASES

Each Instrument stamped (E) and with quality mark (S).



No. 937.

No. 937. Cont'g:

No. 806 Ruling Pen, 4¼ in., with spring and ebony handle.
808 " " 5½ " " " " " "
860 Steel Spring Bow Dividers, 3½ in., metal handle.
861 " " " Pencil, 3½ " " "
862 " " " Pen, 3½ " " "
903 Hairspring Dividers, 6 in., pivot joint.
913 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar, pivot joint.
977 Combination Lead Box and Key. Per set, $13 50

No. 937B. Containing same assortment as No. 937, but with circular spring bows Nos. 863A, 863B, 863C, in place of Nos. 860, 861, 862. Per set, ... 13 50

No. 937C. Containing same assortment as No. 937, but having center wheel bows Nos. 864, 865, 866, in place of Nos. 860, 861, 862. Per set, ... 15 00

No. 937H. Containing same assortment as No. 937, but with Hairspring Compasses No. 914 in place of No. 913. Per set, . . 14 15

No. 937S. Containing same assortment as No. 937, but Compasses and Dividers with straightening device. Per set, . . 13 90

No. 937SH. Containing same assortment as No. 937H, but Compasses and Dividers with straightening device. Per set, . . 14 55

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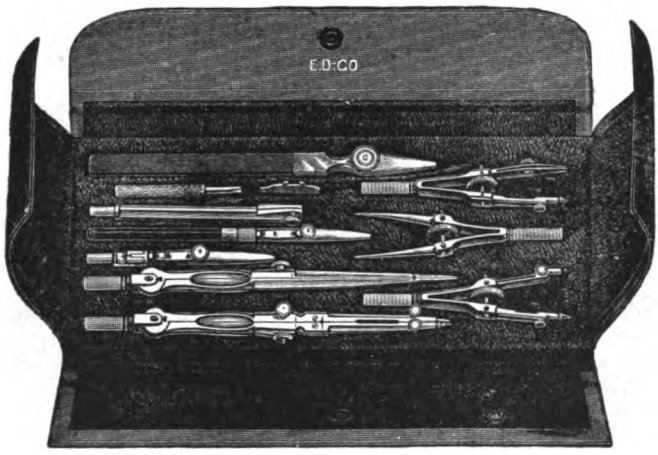
SUPERIOR INSTRUMENTS

Second Best Grade

IN CASES

Each Instrument stamped (E) and with quality mark (S).



No. 938.

No. 938. Cont'g:

No. 807 Ruling Pen, 5 in., with spring and ebony handle.
837 Detail " 6 " " " for long lines.
864 Steel Spring Bow Dividers, 3½ in., metal handle.
865 " " " Pencil, 3½ " " "
866 " " " Pen, 3½ " " "
903 Hairspring Dividers, 6 in., pivot joint.
914 Compasses, 6 in., hairspring, with fixed needle point, pen, pencil point and lengthening bar, pivot joint.
977 Combination Lead Box and Key. Per set, . $15 00

No. 938B. Containing same assortment as No. 938, but with circular spring bows Nos. 868A, 868B, 868C, in place of Nos. 864, 865, 866. Per set, ... 15 00

No. 938S. Containing same assortment as No. 938, but Compasses and Dividers with straightening device. Per set, . 15 40

No. 939. Containing same assortment as No. 938, but having Compasses No. 913 in place of No. 914. Per set, . . . 14 30

No. 939S. Containing same assortment as No. 939, but Compasses and Dividers with straightening device. Per set, . . . 14 70

Any other assortments in morocco cases fitted up to order at short notice.

See Empty Morocco Cases on pages 168-169.

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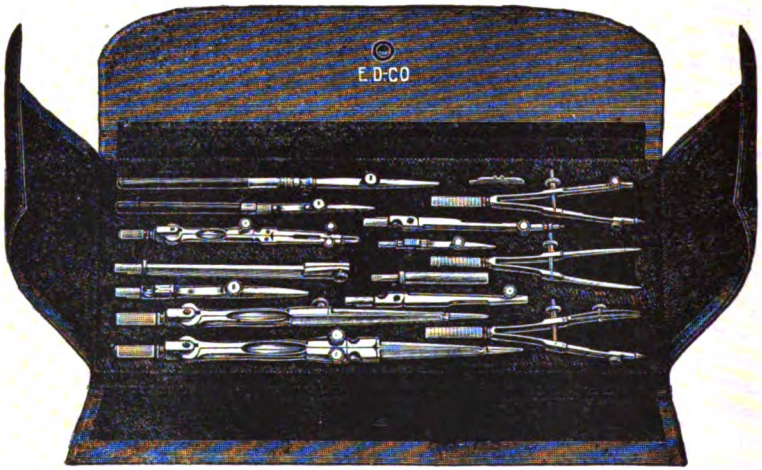
SUPERIOR INSTRUMENTS

Second Best Grade

IN CASES

Each Instrument stamped (E) and with quality mark (S).



No. 940.

No. 940. Cont'g:

No. 806 Ruling Pen, 4¼ in., with spring and ebony handle.
820 " " 5½ " with pin and joint, ebony handle.
860 Steel Spring Bow Dividers, 3½ in., metal handle.
861 " " " Pencil, 3½ " " "
862 " " " Pen, 3½ " " ".
903 Hairspring Dividers, 6 in., pivot joint.
908 Compasses, 4¼ in., with fixed needle point, pen and pencil point, pivot joint.
915 Compasses, 6 in., with 2 steel points, pen, pencil and needle point, and lengthening bar, pivot joint.

977 Combination Lead Box and Key. Per set, . $17 40

No. 940B. Containing same assortment as No. 940, but with circular spring bows Nos. 863A, 863B, 863C, in place of Nos. 860, 861, 862. Per set, ... 17 40

No. 941. Containing same assortment as No. 940, but with No. 808 Ruling Pen in place of No. 820, and No. 913 Compasses in place of No. 915. Per set, ... 16 50

Any other assortments in morocco cases fitted up to order at short notice.

See Empty Morocco Cases on pages 168-169.

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FEDERAL INSTRUMENTS

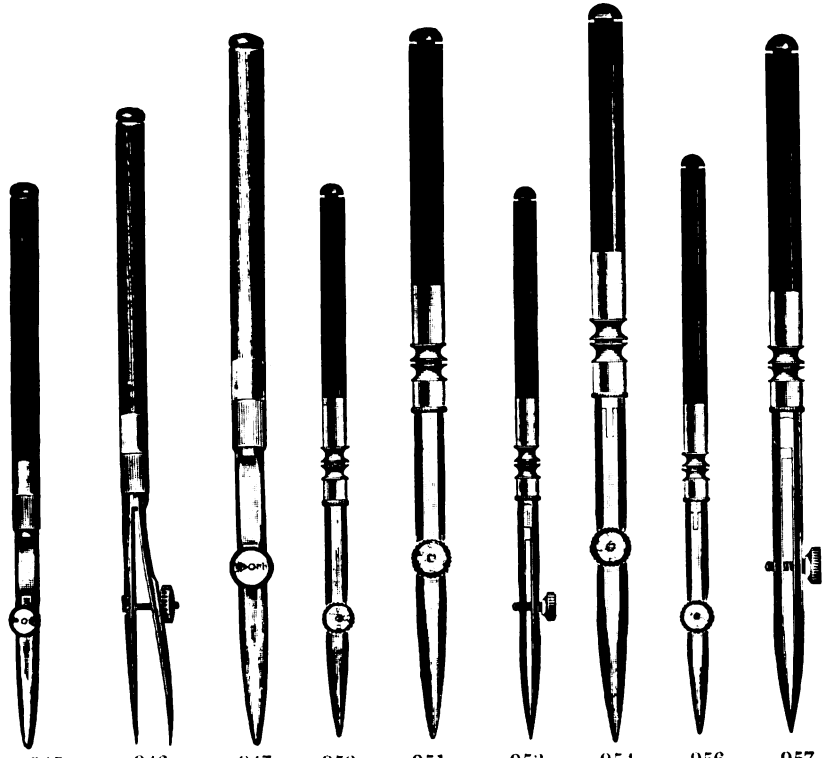
The Third Best Grade of Instruments.

Of Rolled German Silver and Steel.

Each Instrument stamped with quality mark [F].

For description of quality see page 72.

Illustrations ⅜ size.



No. 945.	946.	947.	950.	951.	953.	954.	956.	957.

No. 945.	Ruling Pen, 4¼ in., ebony handle, upper blade with spring,	Each, $0 55
946.	Ruling Pen, 5 in., ebony handle, upper blade with spring,	" 60
947.	Ruling Pen, 5½ in., ebony handle, upper blade with spring,	" 65
950.	Ruling Pen, 4 in., ebony handle, no joint,	" 30
951.	" " 5½ " " " " " "	" 35
953.	" " 4 " " " improved joint,	" 45
954.	" " 5½ " " " " "	" 54
956.	" " 4 " " " " " and pin,	60
957.	" " 5½ " " " " " "	66

Aluminum handles for above pens furnished at 10 cents each additional.

Pens carefully dressed and sharpened, each 20 to 25 cents.

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FEDERAL INSTRUMENTS

Third Best Grade

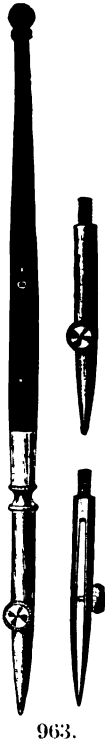
Of Rolled German Silver and Steel.

Each Instrument stamped with quality mark [F].

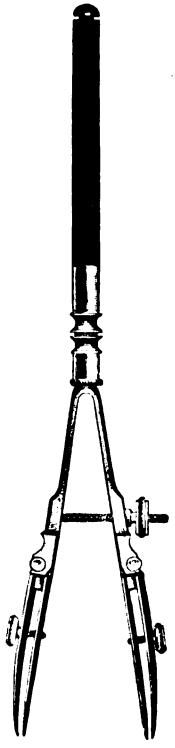
Illustrations ⅜ size.

No. 960.

962.



963.



968.

		Each.
No. 960.	Ruling Pen, 5½ in., improved joint, German silver blades, .	$0 60
961.	" " 5½ " " " and pin, German silver blades, ...	72
	(Nos. 960-961 are intended for ruling with colored inks.)	
962.	Hatching Pen, 5 in., with pushing screw, ...	75
963.	" " 5 " " " " 3 pens to one handle, ...	1 50
968.	Railroad Pen, 5½ in., both pens with joint, ...	2 40

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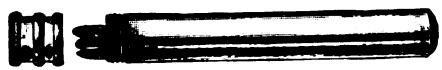
FEDERAL INSTRUMENTS

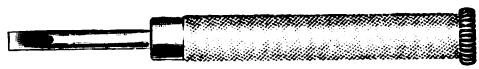
Third Best Grade

Of Rolled German Silver and Steel.

No. 975.



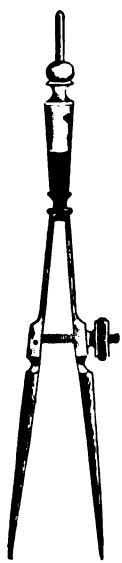
No. 976.



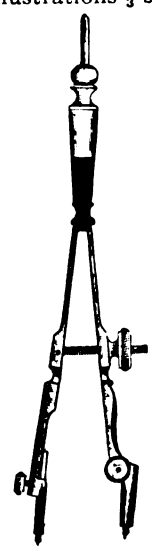
No. 977.

No. 975.	Flat Box with 4 Patent Leads for instruments, . .	Each,	$0 10
976.	Round " " 3 " " " " . .	"	10
977.	Combination Key and Lead Box, with three Patent Leads, "		25

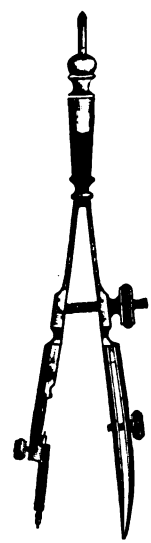
Illustrations ⅔ size.



No. 984.



985.



986.

No. 984.	Steel Spring Bow Dividers, 4 in., white handle, . .	Each,	$0 90
985.	" " " Pencil, 4 " " " . .	"	1 15
986.	" " " Pen, 4 " " " . .	"	1 15
987.	Set of Bows, Nos. 984, 985, 986, in case, ...	Per set,	3 80

Above Bow Pencils and Bow Pens fitted with our patent screw-thread needle points. Patented Dec. 26, 1899.

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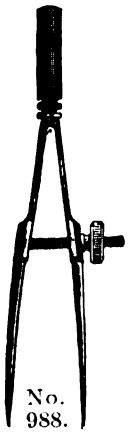
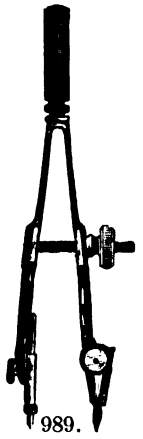
FEDERAL INSTRUMENTS

Third Best Grade

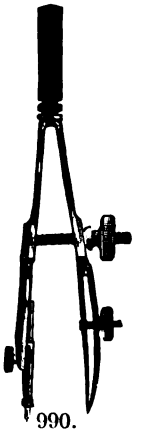
Of Rolled German Silver and Steel.
Each Instrument stamped with quality mark [F].
Illustrations ⅜ size.



No. 988.

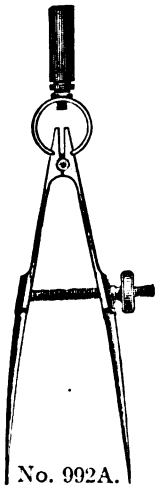


989.

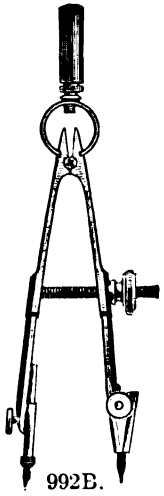


990.

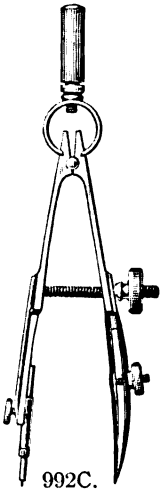
No. 988.	Steel Spring Bow Dividers, 3½ in., metal handle, .	Each,	$0 90
989.	" " " Pencil, 3½ " " " .	"	1 15
990.	" " " Pen, 3½ " " " .	"	1 15
991.	Set of Bows, Nos. 988, 989, 990, in case, . . .	Per set,	3 80



No. 992A.



992B.



992C.

		Each.
No. 992A.	Circular Steel Spring Bow Dividers, 3½ in., metal handle,	$0 90
992B.	" " " " Pencil, 3½ " " "	1 15
992C.	" " " " Pen, 3½ " " "	1 15
992D.	Set of Bows, Nos. 992A, 992B, 992C, in case, . .	Per set, 3 80

Above Bow Pencils and Bow Pens fitted with our patent screw-thread needle points. Patented Dec. 26, 1899.

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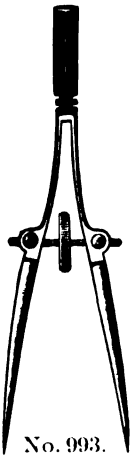
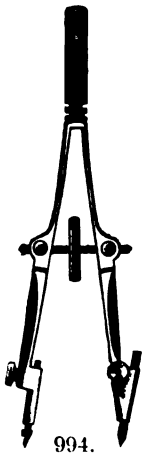
FEDERAL INSTRUMENTS

Third Best Grade

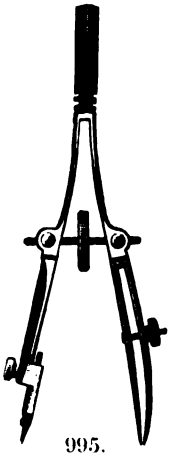
Of Rolled German Silver and Steel.
Each instrument stamped with quality mark [F].
Illustrations ⅜ size.



No. 993.

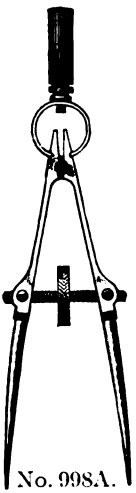


994.

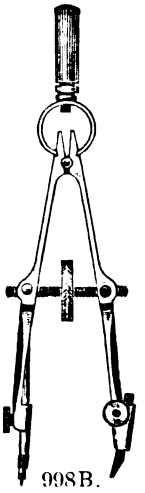


995.

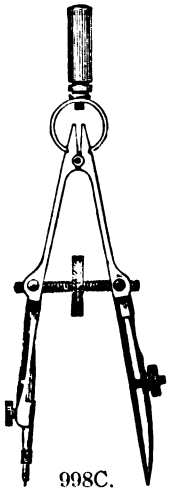
No. 993.	Steel Spring Bow Dividers, 3½ in., metal handle,	Each,	$1 25
994.	" " " Pencil, 3½ " " "	"	1 50
995.	" " " Pen, 3½ " " "	"	1 50
996.	Set of Bows, Nos. 993, 994, 995, in case,	Per set,	5 00



No. 998A.



998B.



998C.

		Each.
No. 998A.	Circular Steel Spring Bow Dividers, 3½ in., metal handle,	$1 25
998B.	" " " " Pencil, 3½ " " "	1 50
998C.	" " " " Pen, 3½ " " "	1 50
998D.	Set of Bows, Nos. 998A, 998B, 998C, in case, Per set,	5 00

Above Bows have a screw on a right-and-left thread, which holds the points firmly in any position. The Bow Pencils and Bow Pens are fitted with our patent screw-thread needle points.

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FEDERAL INSTRUMENTS

Third Best Grade

Of Rolled German Silver and Steel.

Each Instrument stamped with quality mark [F].

Illustrations ⅔ size.

No. 1005. 1007. 1013. 1016. 1019. 1020. 1021.

No.					
1005.	Plain Dividers,	3½ in.,	Each,	$0	72
1007.	" "	6 "	"		84
1007S.	" "	6 " with straightening device,	"	1	04
1008.	" "	7 "	"		96
1013.	Three-legged Dividers,	5 "	"	3	00
1016.	Hairspring Dividers,	6 "	"	1	80
1016S.	" "	6 " with straightening device,	"	2	00
1017.	" "	7 "	"	2	30
1019.	Compasses	4½ in., with fixed needle and pencil point,	"	2	30
1020.	"	4½ " " " " pen point,	"	2	30
1020½.	Compasses, pencil point,	4½ " " fixed needle point, pen and	"	2	65
1021.	Compasses,	4½ in., with 2 steel points, pen, pencil and needle point,	"	3	00

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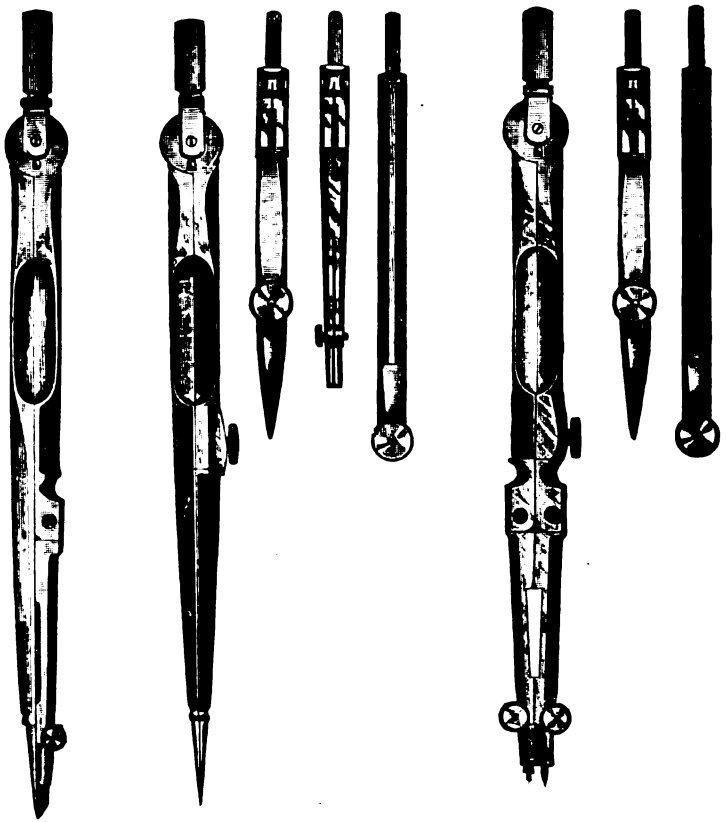
FEDERAL INSTRUMENTS

Third Best Grade

Of Rolled German Silver and Steel.

Each Instrument stamped with quality mark [F].

Illustrations ⅛ size.



No. 1022. 1023. 1024.

No. 1022.	Compasses, 6 in., with steel point leg and fixed pencil point,	Each,	$1 25
1023.	Compasses, 6 in., with steel point, pen, pencil point and lengthening bar,	"	2 40
1024.	Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar,	"	2 65
1024S.	Compasses, 6 in., like No. 1024, but with straightening device,	"	2 85
1025.	Compasses, 6 in., Hairspring, with fixed needle point, pen, pencil point and lengthening bar,	"	3 25
1025S.	Compasses, 6 in., like No. 1025, but with straightening device,	"	3 45

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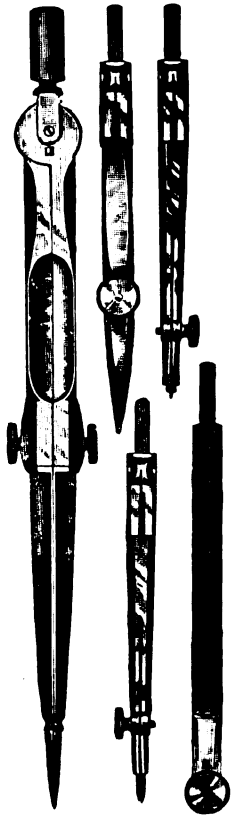
FEDERAL INSTRUMENTS

Third Best Grade

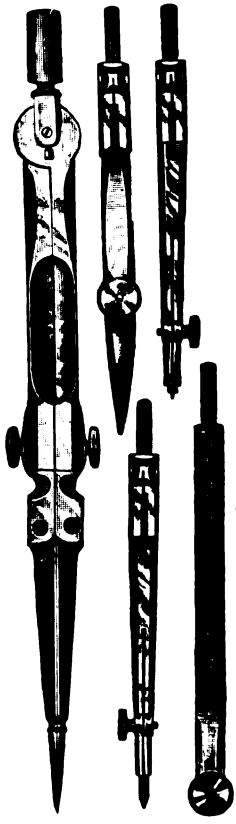
Of Rolled German Silver and Steel.

Each Instrument stamped with quality mark [F].

Illustrations ½ size.



No. 1026.



1027.

No. 1026. Compasses, 6 in., with 2 steel points, pen, pencil and needle point, and lengthening bar, ... Each, **$3 00**

1027. Compasses, 6 in., the same as No. 1026, but with joint in each leg, ... " **3 90**

Above Compasses fitted with our patent screw-thread needle points.

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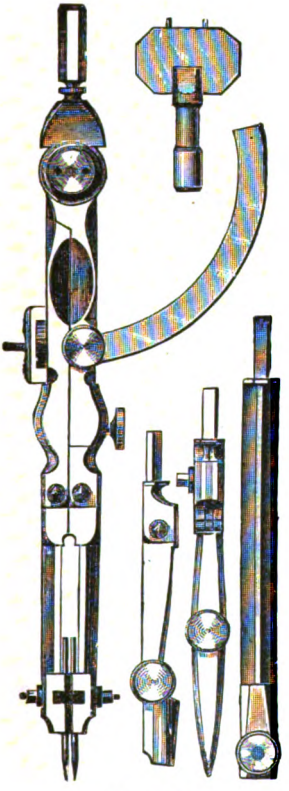
FEDERAL INSTRUMENTS

Third Best Grade

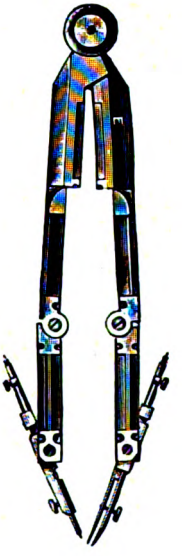
Of Rolled German Silver and Steel.

Each Instrument stamped with quality mark [F].

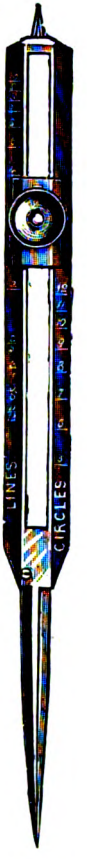
Illustrations ⅜ size



No. 1028.



1029.



1031.

No. 1028.	Lithographic Compasses, very strong, with arc, set screw and micrometer adjustment, 8 in., with pen and pencil point, lengthening bar and wrench key, in case, Each,	$13 80
1029.	Pocket Compasses, with folding points, pen, pencil and needle points, ... "	5 70
1031.	Proportional Divider, 7¼ in., for lines and circles, in case, ... "	6 90

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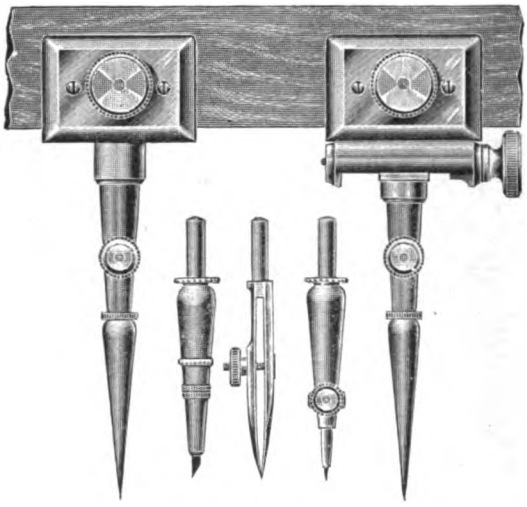
FEDERAL INSTRUMENTS

Third Best Grade

Of Rolled German Silver and Steel.

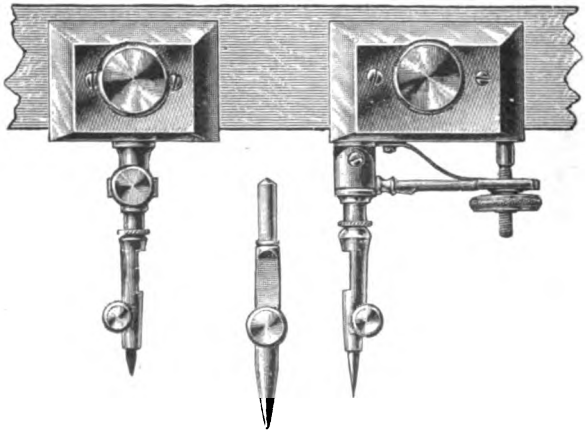
Each instrument stamped with quality mark [F].



No. 1033.

No. 1033. Beam Compasses, to fit on any straight edge, with two steel points, pen, pencil and needle point, and micrometer adjustment, ... Each, **$5 75**

1033C. Beam Compasses No. 1033 in morocco case, . . " **6 50**



No. 1034.

No. 1034. Beam Compasses, to fit on any straight edge, with fixed needle, pen and pencil points, and micrometer adjustment, ... Each, **$5 80**

1034C. Beam Compasses No. 1034 in morocco case, . . " **6 60**

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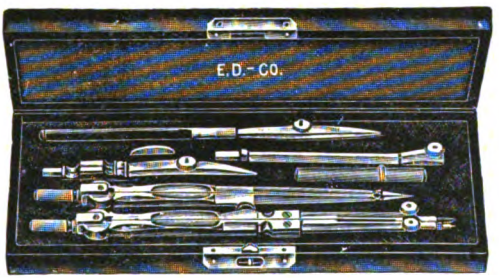
FEDERAL INSTRUMENTS

IN MOROCCO POCKET CASES, LINED WITH SILK VELVET.

The Third Best Grade of Instruments.

Of Rolled German Silver and Steel.

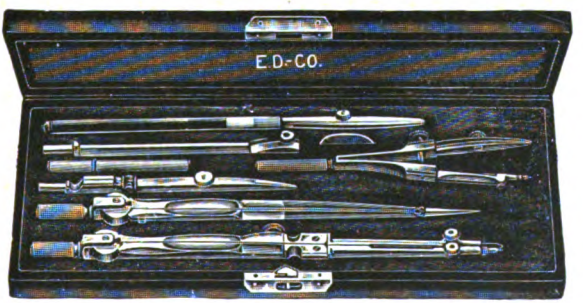
For description of quality see page 72.



No. 1059.

No. 1059. Cont'g:
No. 947 Ruling Pen, 5½ in., with spring and ebony handle.
1007 Plain Dividers, 6 in.
1024 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar.
Box with Leads. Per set, ... $4 60

No. 1059S. Containing same assortment as No. 1059, but Dividers and Compasses with straightening device. Per set, . 5 00



No. 1062.

No. 1062. Cont'g:
No. 947 Ruling Pen, 5½ in., with spring and ebony handle.
990 Steel Spring Bow Pen, 3½ in., metal handle.
1007 Plain Dividers, 6 in.
1024 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar.
Box with Leads. Per set, ... $6 00

No. 1062S. Containing same assortment as No. 1062, but Dividers and Compasses with straightening device. Per set, . 6 40

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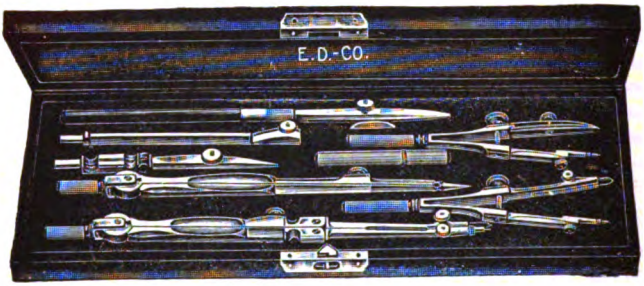
FEDERAL INSTRUMENTS

Third Best Grade

IN CASES

Each Instrument stamped with quality mark [F].



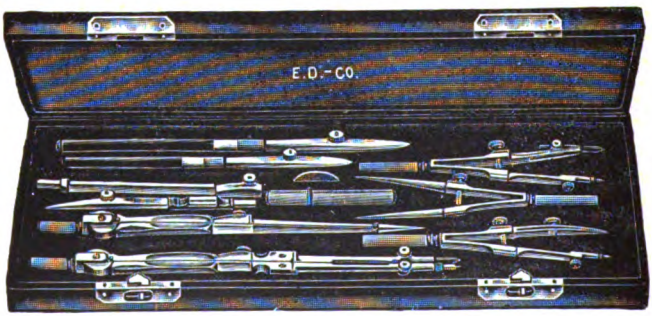
No. 1064.

No. 1064.
Cont'g: No. 947 Ruling Pen, 5½ in., with spring and ebony handle.
989 Steel Spring Bow Pencil, 3½ in., metal handle.
990 " " " Pen, 3½ " " "
1016 Hairspring Dividers, 6 in.
1024 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar.
Box with Leads. Per set, ... $8 60

No. 1064S. Containing same assortment as No. 1064, but Dividers and Compasses with straightening device. Per set, . . 9 00

No. 1065. Containing same assortment as No. 1064, but in Pocket Book Case, velvet lined. Per set, ... 9 10

No. 1065S. Containing same assortment as No. 1065, but Dividers and Compasses with straightening device. Per set, . 9 50



No. 1068

No. 1068.
Cont'g: No. 945 Ruling Pen, 4½ in., with spring and ebony handle.
947 " " 5½ " " " " " " "
988 Steel Spring Bow Dividers, 3½ in., metal handle.
989 " " " Pencil, 3½ " " "
990 " " " Pen, 3½ " " "
1016 Hairspring Dividers, 6 in.
1024 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar.
Box with Leads. Per set, ... $9 50

No. 1068B. Containing same assortment as No. 1068, but with circular spring bows Nos. 992A, 992B, 992C, in place of Nos. 988, 989, 990. Per set, ... 9 50

No. 1068S. Containing same assortment as No. 1068, but Dividers and Compasses with straightening device. Per set, . . 9 90

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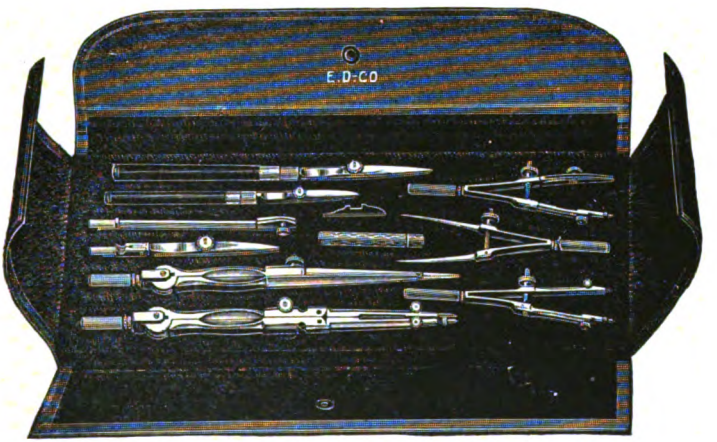
FEDERAL INSTRUMENTS

Third Best Grade

IN CASES

Each Instrument stamped with quality mark [F].



No. 1070.

No. 1070. In Pocket Book case, velvet lined, cont'g:
No. 945 Ruling Pen, 4¼ in., with spring and ebony handle.
947 " " 5½ " " " " " "
988 Steel Spring Bow Dividers, 3½ in., metal handle.
989 " " " Pencil, 3½ " " "
990 " " " Pen, 3½ " " "
1016 Hairspring Dividers, 6 in.
1024 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar.
Box with Leads. Per set, ... $10 00

No. 1070B. Containing same assortment as No. 1070, but with circular spring bows Nos. 992A, 992B, 992C, in place of Nos. 988, 989, 990. Per set, ... 10 00

No. 1070S. Containing same assortment as No. 1070, but Dividers and Compasses with straightening device. Per set, 10 40

Any other assortments in morocco cases fitted up to order at short notice.

See Empty Morocco Cases on pages 168-169.

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IN CASES

Each Instrument stamped with quality mark [F].

No. 1075.

No. 1075. Cont'g:
No. 945 Ruling Pen, 4½ in., with spring and ebony handle.
947 " " 5½ " " " " " " "
988 Steel Spring Bow Dividers, 3½ in., metal handle.
989 " " " Pencil, 3½ " " "
990 " " " Pen, 3½ " " "
1016 Hairspring Dividers, 6 in.
1019 Compasses, 4½ in., with fixed needle and pencil point.
1020 Compasses, 4½ in., with fixed needle and pencil point.
1024 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar.
Box with Leads Per set, ... $14 60

No. 1075B. Containing same assortment as No. 1075, but with circular spring bows Nos. 992A, 992B, 992C, in place of Nos. 988, 989, 990. Per set, ... 14 60

No. 1075P. Containing same assortment as No. 1075, but in Pocket Book case, velvet lined. Per set, ... 15 25

Any other assortments in morocco cases fitted up to order at short notice.

See Empty Morocco Cases on pages 168-169.

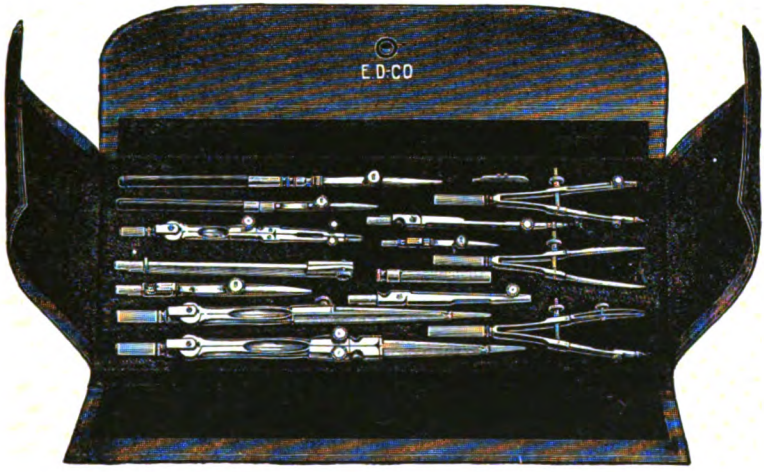
Digitized by Google

FEDERAL INSTRUMENTS

Third Best Grade

IN CASES

Each Instrument stamped with quality mark [F].



No. 1078.

No. 1078. In Pocket Book case, velvet lined, cont'g:
No. 945 Ruling Pen, 4¼ in., with spring and ebony handle.
947 " " 5½ " " " " " "
988 Steel Spring Bow Dividers, 3½ in., metal handle.
989 " " " Pencil, 3½ " " "
990 " " " Pen, 3½ " " "
1016 Hairspring Dividers, 6 in.
1020½ Compasses, 4¼ in., with fixed needle point, pen and pencil point.
1026 Compasses, 6 in., with 2 steel points, pen, pencil and needle point, and lengthening bar.
Box with Leads. Per set, ... $14 25

No. 1078B. Containing same assortment as No. 1078, but with circular spring bows, Nos. 992A, 992B, 992C, in place of Nos. 988, 989, 990. Per set, ... 14 25

Any other assortments in morocco cases fitted up to order at short notice.

See Empty Morocco Cases on pages 168-169.

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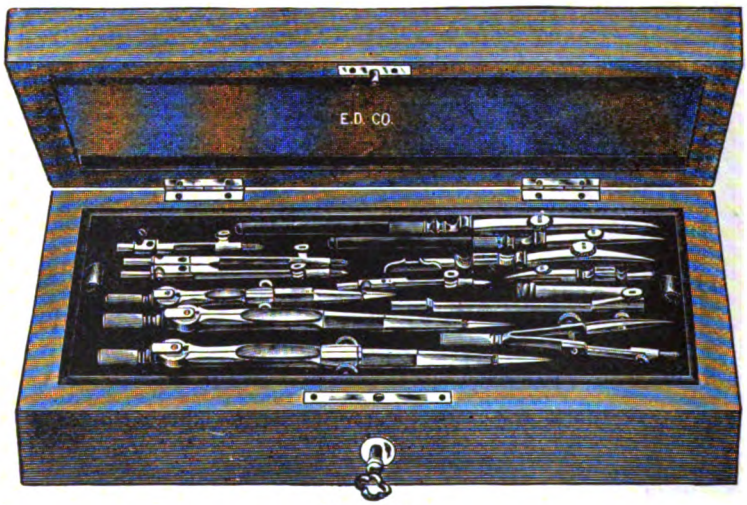
FEDERAL INSTRUMENTS

Third Best Grade

IN CASES

Each Instrument stamped with quality mark [F].



No. 1082.

No. 1082. In fine polished black walnut case, with lock and tray—

Cont'g: No. 953 Ruling Pen, 4 in., with joint.

957 " " 5½ " with joint and pin.

990 Steel Spring Bow Pen, 3½ in.

1007 Plain Dividers, 6 in.

1021 Compasses, 3½ in., with 2 steel points, pen, pencil and needle point.

1026 Compasses, 6 in., with 2 steel points, pen, pencil, needle point and lengthening bar.

Box with Leads. Per set, ... **$14 10**

No. 1083. The same as No. 1082, but with Hairspring Dividers No. 1016, in place of Plain Dividers, and with additional Bow Dividers No. 988, and Bow Pencil No. 989.

Per set, ... **17 40**

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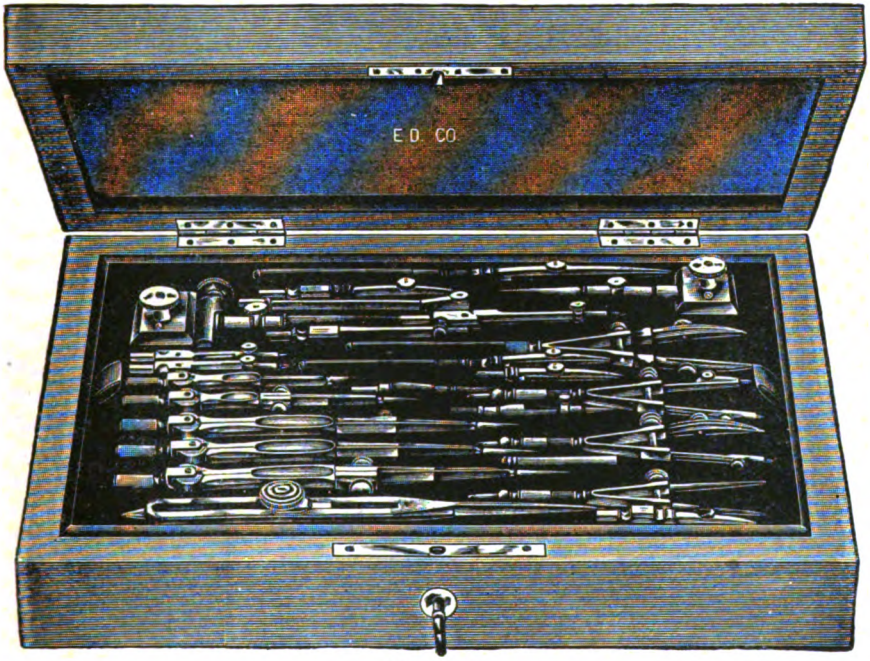
FEDERAL INSTRUMENTS
IN CASES

Third Best Grade

Each Instrument stamped with quality mark [F].



No. 1085.

No. 1084. In fine polished black walnut case, with lock and tray—
Cont'g: No. 953 Ruling Pen, 4 in., with joint.
957 " " 5½ " with joint and pin.
968 Railroad Pen, 5½ in.
984 Steel Spring Bow Dividers, 4 in.
985 " " " Pencil, 4 "
986 " " " Pen, 4 "
1005 Plain Dividers, 3½ in., with handle.
1007 " " 6 " " "
1016 Hairspring Dividers, 6 in.
1021 Compasses, 3½ in., with 2 steel points, pen, pencil and needle point.
1026 Compasses, 6 in., with 2 steel points, pen, pencil and needle point, and lengthening bar.
1031 Proportional Dividers, 7¼ in.
Box with Leads. Per set, ... $31 50

No. 1085. Containing the same as No. 1084, with addition of Beam Compasses No. 1033. Per set, ... 39 00

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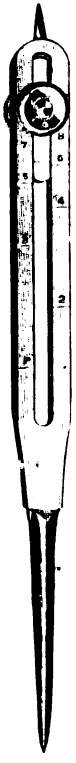
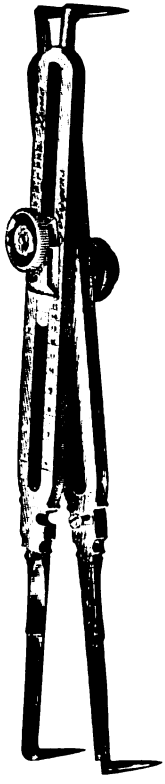
PROPORTIONAL DIVIDERS



No. 1090.

1092.



1093.

No. 1090.	Brass Proportional Dividers, 6¼ in., in case, . .	Each,	$1 92
1091.	German Silver Proportional Dividers, 6¼ in., in case,	"	2 40
1092.	German Silver Proportional Dividers, 7 in , with Rack-Movement, graduated for lines and circles, in case,	"	6 00
1093.	German Silver Proportional Dividers, 7 in., with rectangular bent points, for lines and circles, in case,	"	7 20

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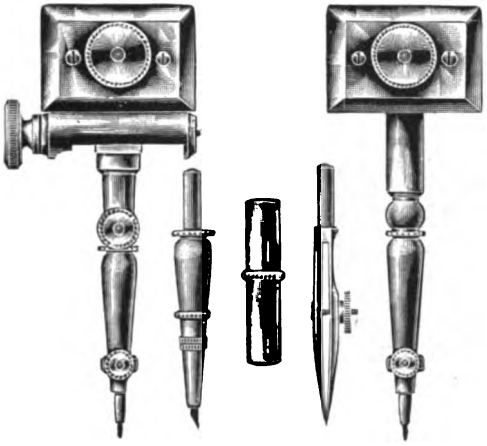
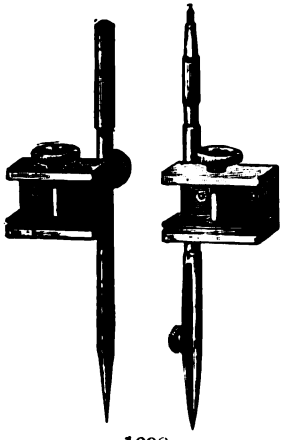
BEAM COMPASSES



No. 1094.



1098.

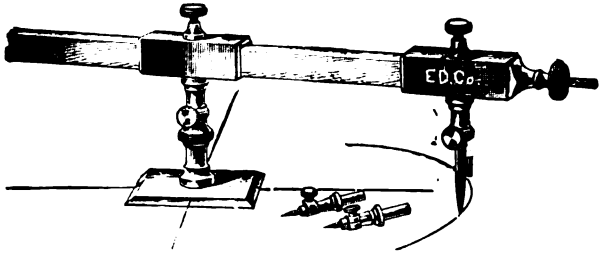
No. 1094. Brass Beam Compasses, with pen, pencil and needle points, in case. . . . . Each, $5 40

1097. German Silver Beam Compasses, with pen, pencil and needle points, in case, ... " 5 70

1098. German Silver Beam Compasses, with steel point, pen and pencil point, ... " 4 00

1098C. Beam Compasses No. 1098 in morocco case, . . " 4 75

IMPROVED BEAM COMPASSES



No. 1099.

No 1099. Beam Compasses, German Silver, with pen, pencil and needle point, and wooden bar 36 in. long. . . . . Each, $7 50

This instrument is an improvement over other forms, as it entirely does away with the common needle point and its accompanying disfigurement of the drawing, and substitutes a pillar which is easily located over the exact center by means of two cross lines on base-plate. Pivoted to the top of this pillar is a bearing, through which the square bar of hardwood slides for rough adjustment and is held by a set screw. The fine adjustment is obtained by the milled-head screw at end of bar, and has a range of about ½ inch. The instrument can also be used like the ordinary beam compasses if desired.

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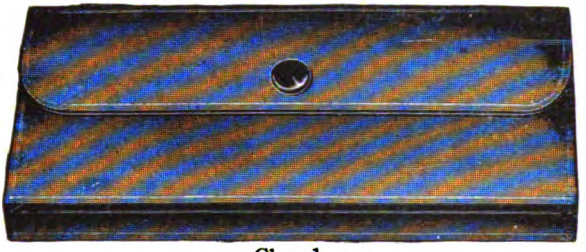
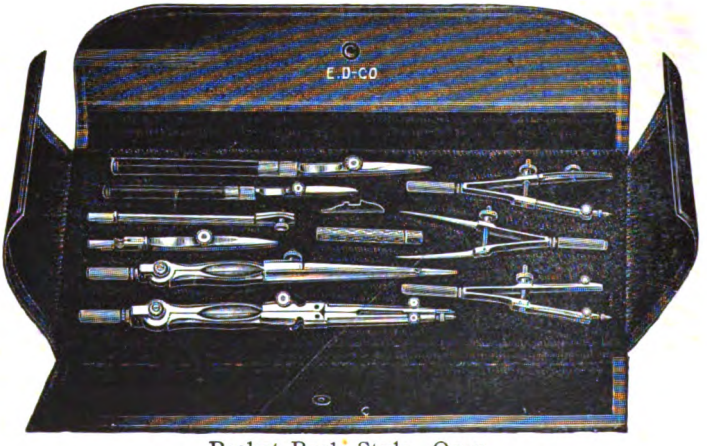
EMPTY POCKET BOOK STYLE CASES

Fitted for such instruments as may be selected.

These cases are covered with morocco leather and lined with either silk or cotton velvet. The Pocket Book Style Cases are superior to the old style Pocket Cases because they are stronger and more compact.



Closed.



Pocket Book Style—Open.

Size of Case.	Lined with Cotton Velvet.	Lined with Silk Velvet.
2½ × 6 inches,	Each, $1 30	Each, $1 50
3 × 7½ "	" 1 75	" 2 00
3½ × 9 "	" 2 00	" 2 50
5 × 9 "	" 2 40	" 3 00
6 × 10 "	" 3 20	" 4 00
7 × 11 "	" 3 70	" 4 50
7 × 13 "	" 4 20	" 5 00
5 × 12½ "	" 3 70	" 4 50

Polished wooden cases with lock and tray furnished to order. We recommend, however, the morocco cases, because they are more serviceable and handier.

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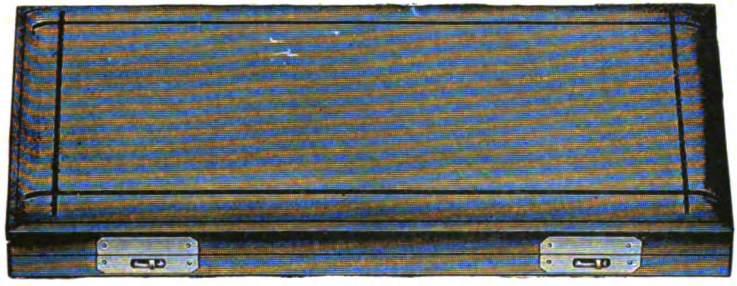
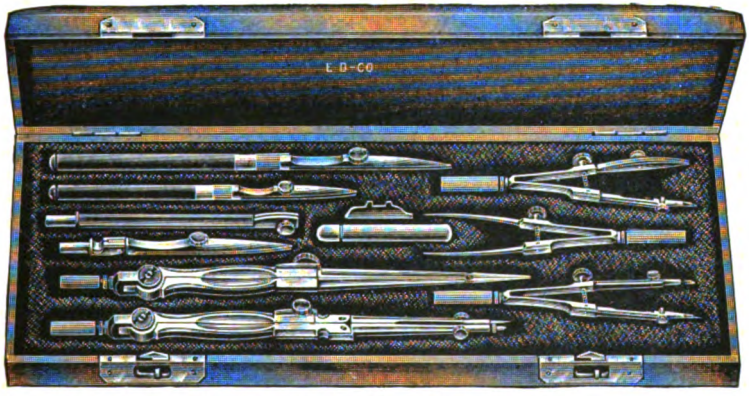
EMPTY MOROCCO SLIDE-CATCH CASES

Fitted for Such Instruments as May Be Selected.

These cases are covered with morocco leather and lined with either silk or cotton velvet. The sets of Instruments listed in the preceding pages in Pocket Book Style Cases, we can also furnish in this style case, made to order, at same prices.



Morocco Slide-Catch Case—Closed



Morocco Slide-Catch Case—Open

Size of Case	Lined with Cotton Velvet	Lined with Silk Velvet
2½ × 6 inches,	Each, $1 30	$1 50
3 × 7½ "	" 1 70	2 00
3½ × 9 "	" 2 00	2 50
5 × 9½ "	" 2 25	2 75
6 × 10 "	" 3 00	3 75
7 × 11 "	" 3 50	4 25
7 × 13 "	" 4 00	4 75
5 × 12½ "	" 3 50	4 25

SEPARATE PARTS FOR INSTRUMENTS.

Since all parts must be fitted to the instruments, it is necessary to send us the instruments for such fitting.

	Parts for Gem Union	Parts for German Inst.
Screws and Nuts,	Each, $0 25	$0 20
Shouldered Needles,	" 15	10
Screw-thread Needle Points,	" 20	15
Ebony and Ivory Handles for Ruling Pens,	" 25	20
Aluminum Handles for Ruling Pens,	" 30	20

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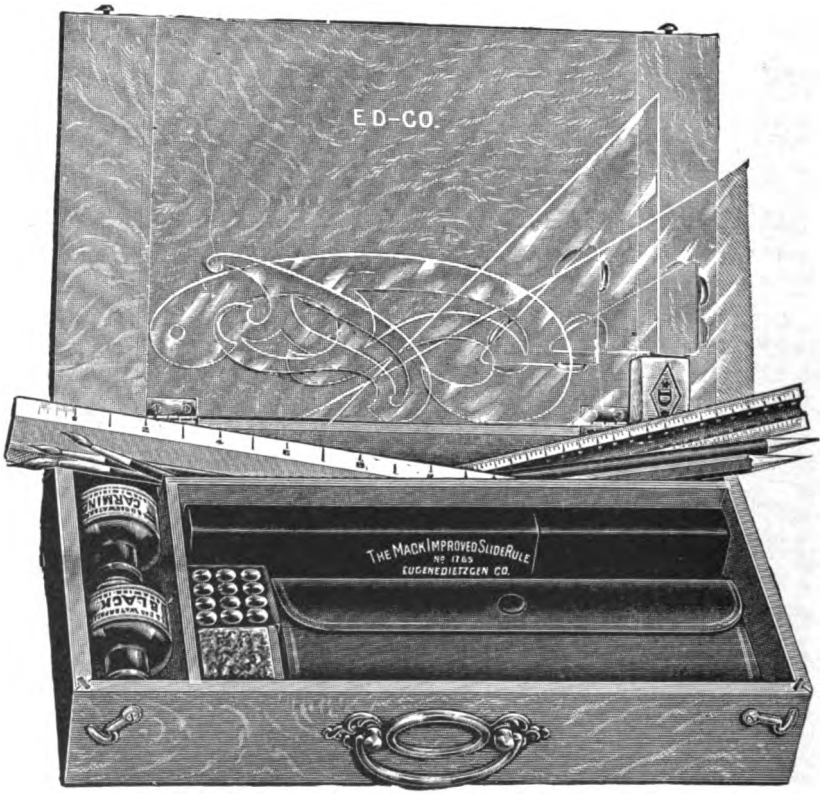
CARRYING CASE FOR DRAWING TOOLS

ESPECIALLY ADAPTED FOR USE OF STUDENTS



No. 1100 (but filled).

No. 1100. Carrying Case, (Empty), Hardwood polished, size, 8¼ × 13¾ × 3 in., ... Each, **$3 50**

These Boxes are made of quarter-sawed oak, nicely polished, with attractive handle for carrying, and are partitioned as shown in illustration. They will hold Set of Instruments, Small Triangles, Curves, Scales, Inks, Pencils, Brushes, Thumb Tacks, Erasers, etc.

Are particularly recommended to students as a safe and reliable way for carrying tools and for storing same when not in use. They are now being used at some of the leading universities, and can also be utilized to good advantage by draftsmen generally.

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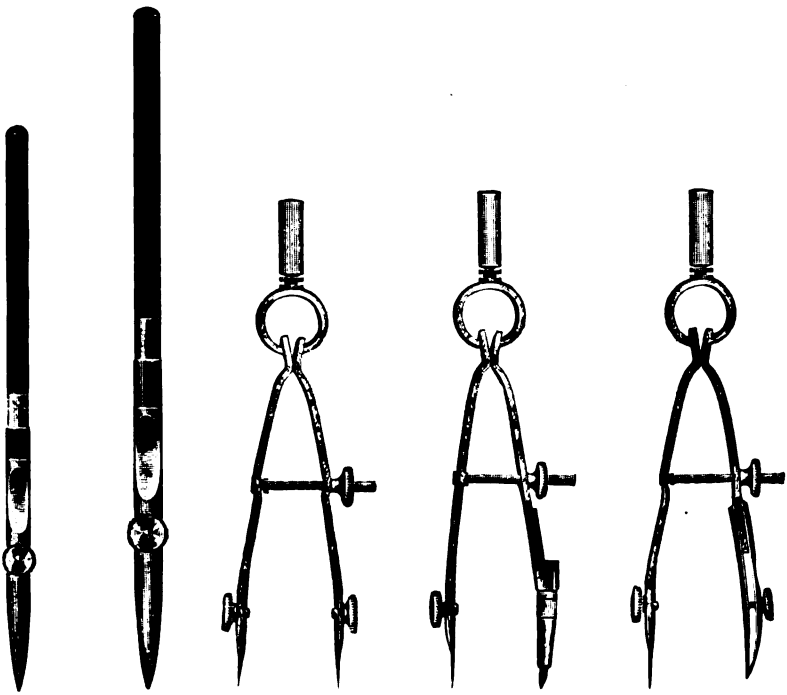
UNIVERSAL INSTRUMENTS

Of German Silver and Steel Points.

Each Instrument stamped with quality mark <U>.

For description of quality see page 72.

Illustrations ⅔ size.



No. 1108. 1110. 1112. 1113. 1114.

No. 1108.	Ruling Pen, 4 in., spring blade, ...	Each,	$0 55
1110.	" " 5¼ " " "	"	65
1112.	Circular Steel Spring Bow Dividers, 3½ in., metal handle, ...	"	90
1113.	Circular Steel Spring Bow Pencil, 3½ in., metal handle,	"	1 10
1114.	" " " " Pen, 3½ " " " "	"	1 10

These Instruments are listed in sets under Nos. 1125 to 1135.

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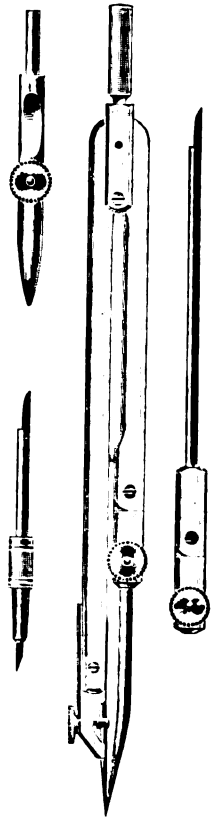
Of German Silver and Steel Points.

Each Instrument stamped with quality mark <U>

Illustrations ⅔ size.

No. 1117.

1118.



1120.

No. 1117.	Plain Dividers, 6 in., ...	Each, $0 80
1118.	Hairspring Dividers, 6 in., ...	" 1 65
1120.	Compasses, 6 in., with fixed needle point, divider point, pen, pencil point and lengthening bar, . .	" 2 45

These Instruments are listed in sets under Nos. 1125 to 1135.

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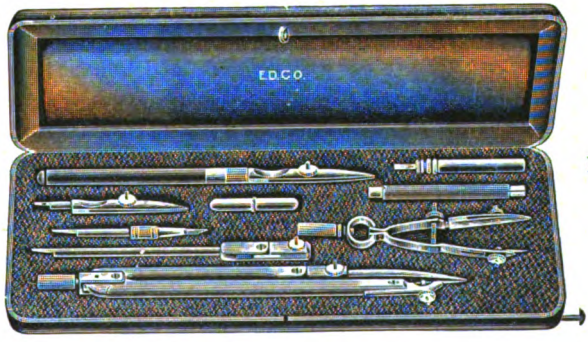
UNIVERSAL INSTRUMENTS

IN MOROCCO POCKET CASES, LINED WITH VELVET.

Of German Silver and Steel Points.

No. 1125.

No. 1125.
Cont'g: No. 1110 Ruling Pen, 5¼ in., spring blade.
1120 Compasses, 6 in., with fixed needle point, divider point, pen, pencil point and lengthening bar.
Box with 3 Needle Points. Metal Handle for Pen, Pencil and Needle parts. Combination Key and Lead Box. Per set, $3 85



No. 1127.

No. 1127.
Cont'g: No. 1110 Ruling Pen, 5¼ in., spring blade.
1114 Circular Steel Spring Bow Pen, 3½ in., metal handle.
1120 Compasses, 6 in., with fixed needle point, divider point, pen, pencil point and lengthening bar.
Box with 3 Needle Points. Metal Handle for Pen, Pencil and Needle parts. Combination Key and Lead Box. Per set, $5 10

No. 1128. Containing same assortment as No. 1127, but with addition of Plain Dividers No. 1117. . . . . Per set, 5 85

No. 1129.
Cont'g: No. 1110 Ruling Pen, 5¼ in., spring blade.
1113 Circular Steel Spring Bow Pencil, 3½ in., metal handle.
1114 " " " " Pen, 3½ " " "
1117 Plain Dividers, 6 in.
1120 Compasses, 6 in., with fixed needle point, divider point, pen, pencil point and lengthening bar.
Box with 3 Needle Points. Metal Handle for Pen, Pencil and Needle parts. Combination Key and Lead Box. Per set, 7 25

For description of quality see page 72.

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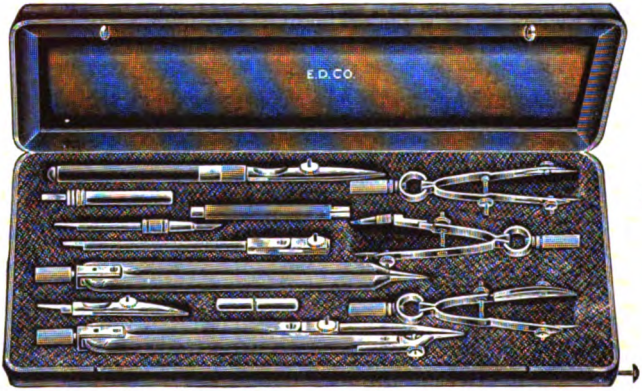
UNIVERSAL INSTRUMENTS IN CASES *Continued*

Each Instrument stamped with quality mark ◁▷.

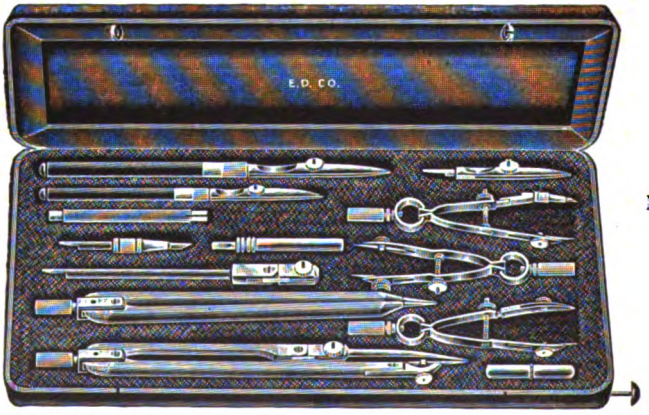
Of German Silver and Steel Points.



No. 1130.

No. 1130. Cont'g: No. 1110 Ruling Pen, 5¼ in., spring blade.
1112 Circular Steel Spring Bow Dividers, 3½ in., metal handle.
1113 " " " " Pencil, 3½ " " "
1114 " " " " Pen, 3½ " " "
1117 Plain Dividers, 6 in.
1120 Compasses, 6 in., with fixed needle point, divider point, pen, pencil point and lengthening bar.
Box with 3 Needle Points. Metal Handle for Pen, Pencil and Needle parts. Combination Key and Lead Box. Per set, $7 90

No. 1131. Cont'g. same assortment as No. 1130, but in Pocket Book Case, 8 25



No. 1134.

No. 1134. Cont'g: No. 1108 Ruling Pen, 4 in., spring blade.
1110 " " 5¼ " " "
1112 Circular Steel Spring Bow Dividers, 3½ in., metal handle.
1113 " " " " Pencil, 3½ " " "
1114 " " " " Pen, 3½ " " "
1118 Hairspring Dividers, 6 in.
1120 Compasses, 6 in., with fixed needle point, divider point, pen, pencil point and lengthening bar.
Box with 3 Needle Points. Metal Handle for Pen, Pencil and Needle parts. Combination Key and Lead Box. Per set, $9 15

No. 1135. Cont'g. same assortment as No. 1134, but in Pocket Book Case, 9 55

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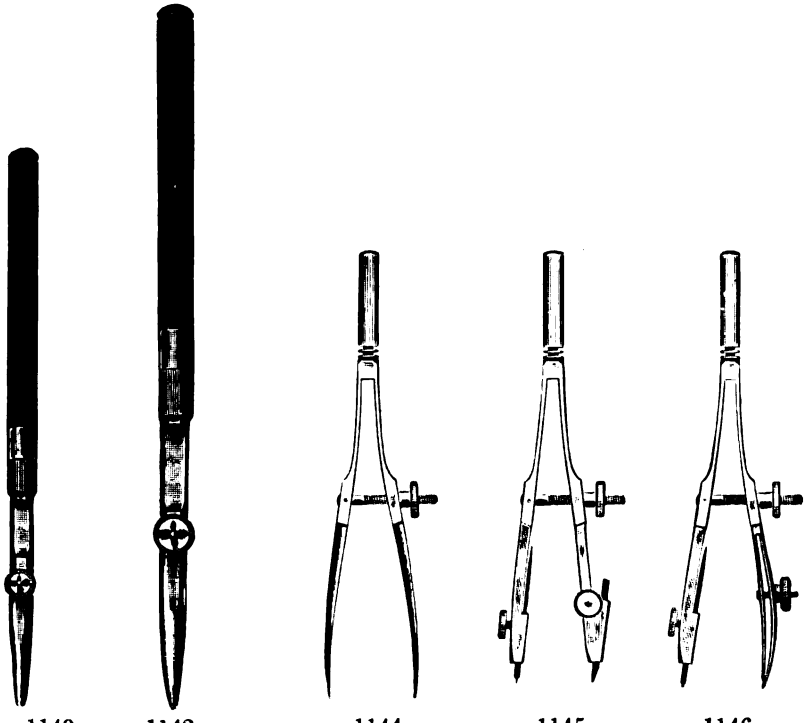
RELIANCE INSTRUMENTS

Of German Silver and Steel Points.

For description of quality see page 72.

Illustrations ⅔ size.



No. 1140. 1142. 1144. 1145. 1146.

No. 1140.	Ruling Pen, 4 in., spring blade, ...	Each,	$0 44
1141.	" " 5 " " "	"	52
1142.	" " 5½ " " "	"	55
1144.	Steel Spring Bow Dividers, 3¼ in., metal handle, .	"	80
1145.	" " " Pencil, 3¼ " " " . .	"	1 00
1146.	" " " Pen, 3¼ " " " . .	"	1 00

These Instruments are listed in sets under Nos. 1159 to 1189PS.

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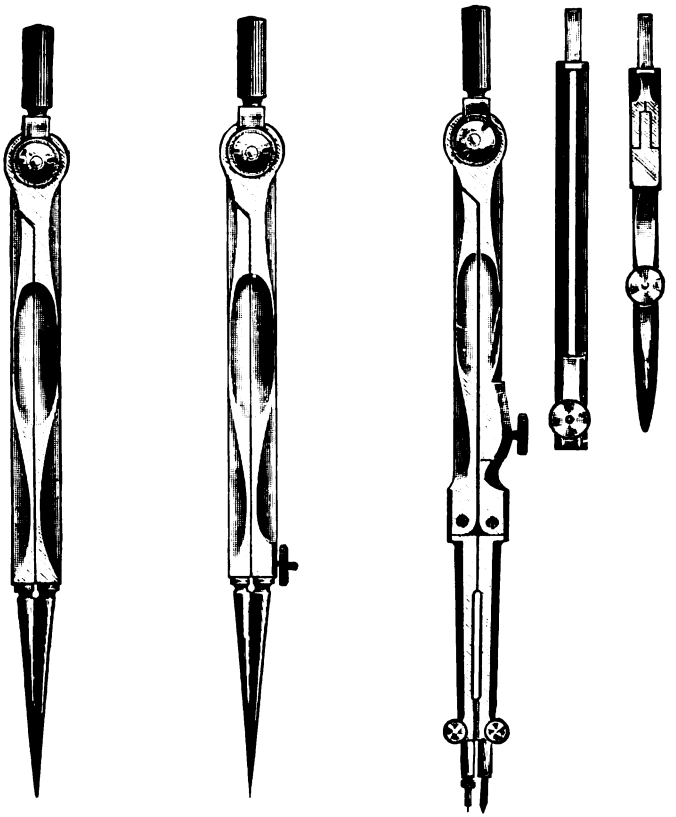
RELIANCE INSTRUMENTS *Continued*

Of German Silver and Steel Points.

Illustrations ⅔ size.



No. 1148. 1149. 1150.

No. 1148.	Plain Dividers, 6 in.,	Each,	$0 60
1149.	Hairspring Dividers, 6 in.,	"	1 35
1150.	Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar,	"	1 90

Above Compasses fitted with our patent screw-thread needle point.

These Instruments are listed in sets under Nos. 1159 to 1169P.

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RELIANCE INSTRUMENTS *Continued*

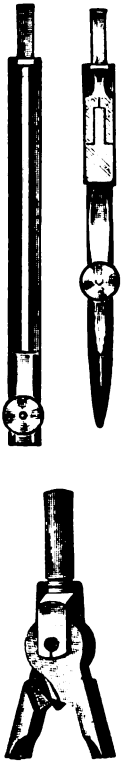
Of German Silver and Steel Points.

Illustrations ⅔ size.

No. 1154.

1155.

1156.



Straightening Device.

No. 1154.	Plain Dividers, 6 in.,	Each,	$0 60
1154S.	Plain Dividers, 6 in., like No. 1154, but with straightening device,	"	70
1155.	Hairspring Dividers, 6 in.,	"	1 35
1155S.	Hairspring Dividers, 6 in., like No. 1155, but with straightening device,	"	1 45
1156.	Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar,	"	1 90
1156S.	Compasses, 6 in., like No. 1156, but with straightening device,	"	2 00

Above Compasses fitted with our patent screw-thread needle point.

These Instruments are listed in sets under Nos. 1179 to 1189PS.

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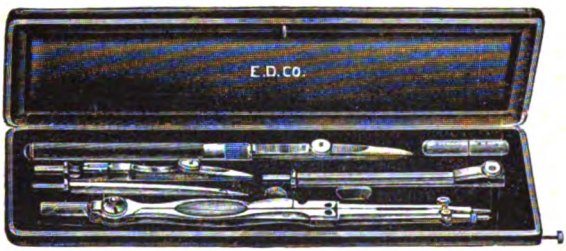
RELIANCE INSTRUMENTS

IN MOROCCO POCKET CASES, LINED WITH VELVET.

Of German Silver and Steel Points.

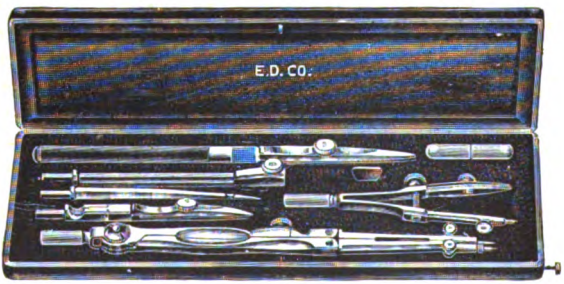
For description of quality see page 72.



No. 1159.

No. 1159. Cont'g:
No. 1142 Ruling Pen, 5½ in., spring blade.
1150 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar.
Extra steel divider point.
Box with Leads.
Per set, ... **$3 00**

No. 1160. Containing same assortment as No. 1159, but with addition of Plain Dividers, No. 1148, and without divider point,
Per set, ... **3 60**



1162.

No. 1162. Cont'g:
No. 1142 Ruling Pen, 5½ in., spring blade.
1146 Steel Spring Bow Pen, 3¼ in., metal handle.
1150 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar.
Extra steel divider point.
Box with Leads.
Per set, ... **$4 00**

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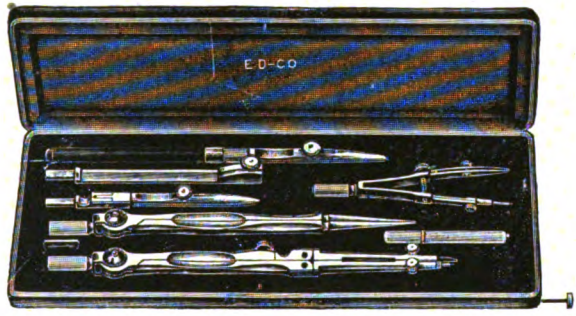
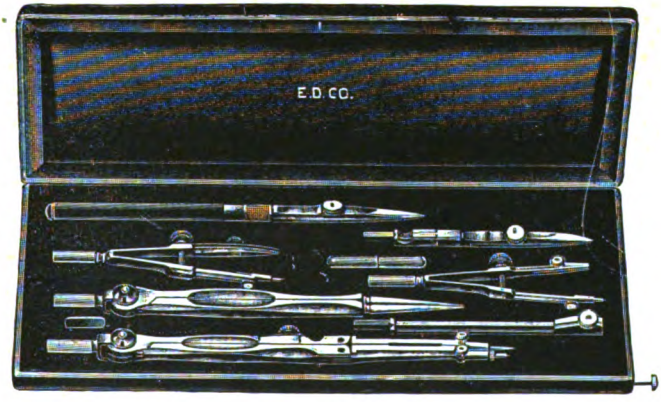
RELIANCE INSTRUMENTS IN CASES *Continued*

Of German Silver and Steel Points.



No. 1163.

No. 1163. Cont'g:
No. 1142 Ruling Pen, 5½ in., spring blade.
1146 Steel Spring Bow Pen, 3¼ in., metal handle.
1148 Plain Dividers, 6 in.
1150 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar.
Box with Leads.
Per set, ... $4 75



No. 1164.

No. 1164. Cont'g:
No. 1142 Ruling Pen, 5½ in., spring blade.
1145 Steel Spring Bow Pencil, 3¼ in., metal handle.
1146 " " " Pen, 3¼ " " "
1148 Plain Dividers, 6 in.
1150 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar.
Box with Leads.
Per set, ... $5 90

No. 1164P. Containing same assortment as No. 1164, but in Pocket Book case. Per set, ... 6 25

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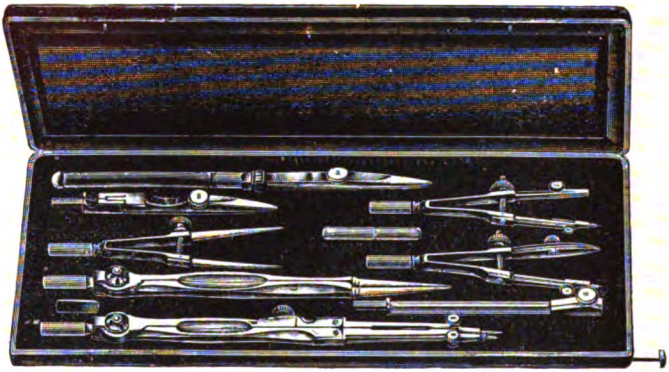
RELIANCE INSTRUMENTS IN CASES *Continued*

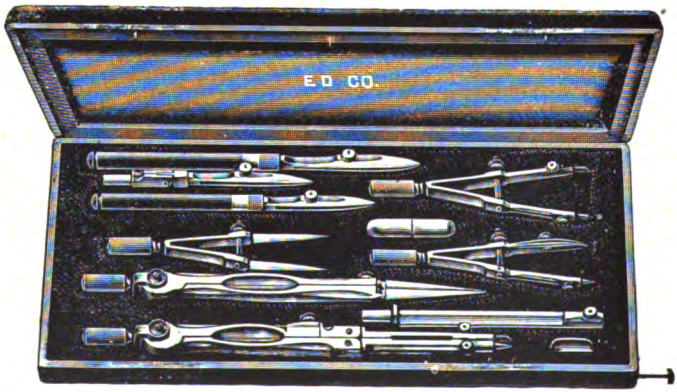
Of German Silver and Steel Points.



No. 1168

No. 1168. Cont'g:
No. 1142 Ruling Pen, 5½ in., spring blade.
1144 Steel Spring Bow Dividers, 3¼ in., metal handle.
1145 " " " Pencil, 3¼ " " "
1146 " " " Pen, 3¼ " " "
1148 Plain Dividers, 6 in.
1150 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar.
Box with Leads. Per set, ... $6 50

No. 1168P. Containing same assortment as No. 1168, but in Pocket Book case. Per set, ... 6 90



No. 1169.

No. 1169. Cont'g:
No. 1140 Ruling Pen, 4 in., spring blade.
1142 " " 5½ " " "
1144 Steel Spring Bow Dividers, 3¼ in., metal handle.
1145 " " " Pencil, 3¼ " " "
1146 " " " Pen, 3¼ " " "
1149 Hairspring Dividers, 6 in.
1150 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar.
Box with Leads. Per set, ... $7 50

No. 1169P. Containing same assortment as No. 1169, but in Pocket Book case. Per set, ... 7 90

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RELIANCE INSTRUMENTS IN CASES *Continued*

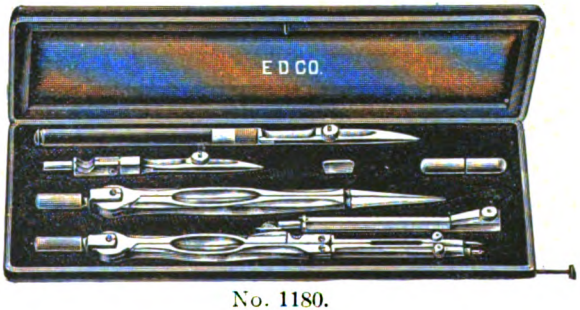
Of German Silver and Steel Points.

No. 1179.

No. 1179. Cont'g:
No. 1142 Ruling Pen, 5½ in., spring blade.
1156 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar.
Extra steel divider point.
Box with Leads.

Per set, ... $3 00

No. 1179S. Containing same assortment as No. 1179, but Compasses with straightening device.
Per set, ... 3 10



No. 1180.

No 1180. Cont'g:
No. 1142 Ruling Pen, 5½ in., spring blade.
1154 Plain Dividers, 6 in.
1156 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar.
Box with Leads.

Per set, ... $3 60

No. 1180S. Containing same assortment as No. 1180, but Dividers and Compasses with straightening device.
Per set, ... 3 80

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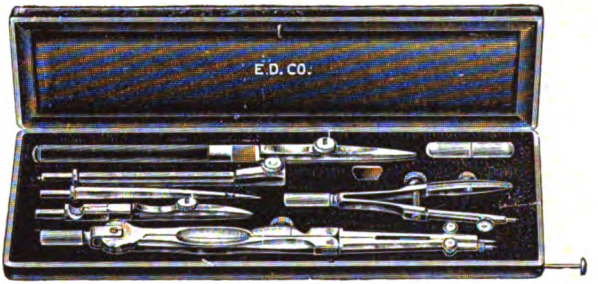
RELIANCE INSTRUMENTS IN CASES *Continued*

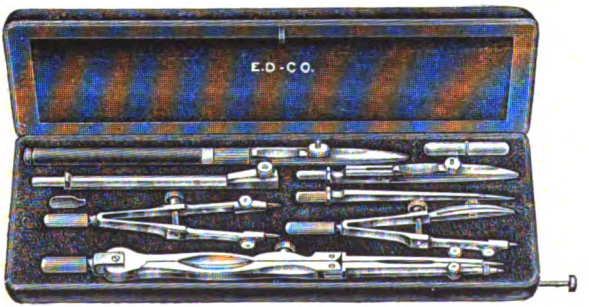
Of German Silver and Steel Points.



No. 1182.

No. 1182. Cont'g:
No. 1142 Ruling Pen, 5½ in., spring blade.
1146 Steel Spring Bow Pen, 3¼ in., metal handle.
1156 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar.
Extra steel divider point.
Box with Leads.
Per set, ... $4 00

No. 1182S. Containing same assortment as No. 1182, but Compasses with straightening device. Per set, ... 4 10



No. 1182B.

No. 1182B. Cont'g:
No. 1142 Ruling Pen, 5½ in., spring blade.
1145 Steel Spring Bow Pencil, 3¼ in., metal handle.
1146 Steel Spring Bow Pen, 3¼ in., metal handle.
1156 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar.
Extra steel divider point.
Box with Leads.
Per set, ... $5 00

No. 1182BS. Containing same assortment as No. 1182B, but Compasses with straightening device.
Per set, ... 5 10

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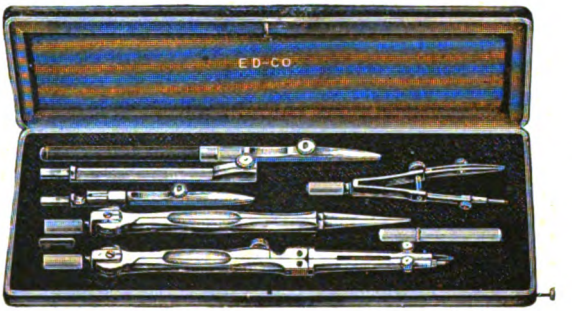
RELIANCE INSTRUMENTS IN CASES *Continued*

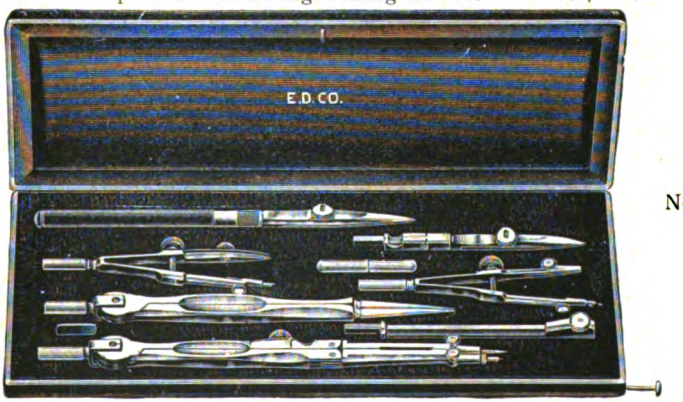
Of German Silver and Steel Points.



No. 1183.

No. 1183. Cont'g:
No. 1142 Ruling Pen, 5½ in., spring blade.
1146 Steel Spring Bow Pen, 3¼ in., metal handle.
1154 Plain Dividers, 6 in.
1156 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar.
Per set, ... $4 75

No. 1183S. Containing same assortment as No. 1183, but Dividers and Compasses with straightening device. Per set, . 4 95



No. 1184.

No. 1184. Cont'g:
No. 1142 Ruling Pen, 5½ in., spring blade.
1145 Steel Spring Bow Pencil, 3¼ in., metal handle.
1146 " " " Pen, 3¼ " " "
1154 Plain Dividers, 6 in.
1156 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar.
Box with Leads.
Per set, ... $5 90

No. 1184S. Containing same assortment as No. 1184, but Dividers and Compasses with straightening device. Per set, . 6 10

No. 1184P. Containing same assortment as No. 1184, but in Pocket Book case. Per set, ... 6 25

No. 1184PS. Containing same assortment as No. 1184P, but Dividers and Compasses with straightening device. Per set, . 6 45

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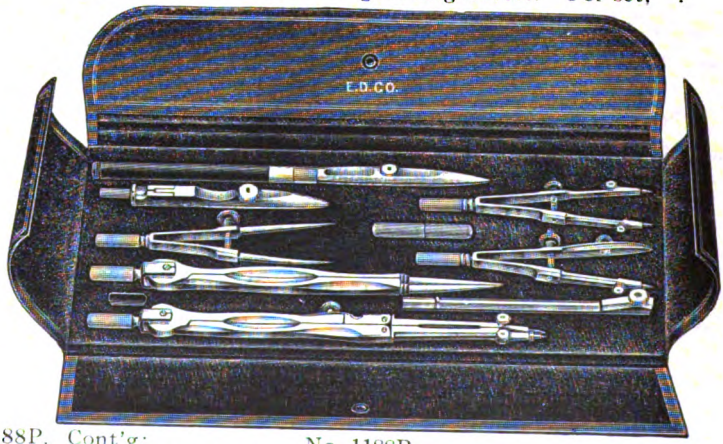
RELIANCE INSTRUMENTS IN CASES *Continued*

Of German Silver and Steel Points.

No. 1188.

No. 1188. Cont'g:
No. 1142 Ruling Pen, 5½ in., spring blade.
1144 Steel Spring Bow Dividers, 3¼ in., metal handle.
1145 " " " Pencil, 3¼ " " "
1146 " " " Pen, 3¼ " " "
1154 Plain Dividers, 6 in.
1156 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar.
Box with Leads. Per set, ... $6 50

No. 1188S. Containing same assortment as No. 1188, but Dividers and Compasses with straightening device. Per set, . 6 70



No. 1188P. Cont'g: No. 1188P.
No. 1142 Ruling Pen, 5½ in., spring blade.
1144 Steel Spring Bow Dividers, 3¼., metal handle.
1145 " " " Pencil, 3¼ " " "
1146 " " " Pen, 3¼ " " "
1154 Plain Dividers, 6 in.
1156 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar.
Box with Leads. Per set, ... $6 90

No. 1188PS. Containing same assortment as No. 1188P, but Dividers and Compasses with straightening device. . Per set, 7 10

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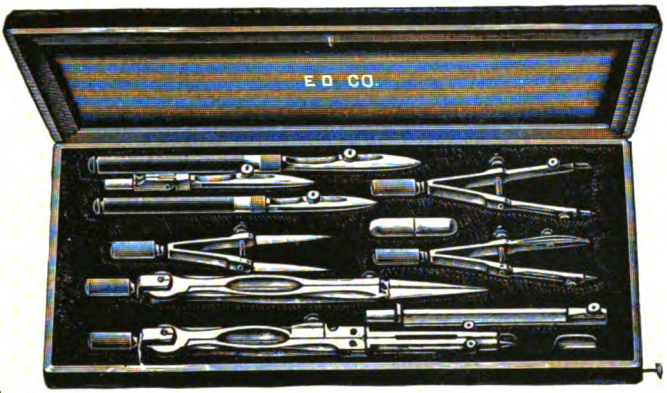
RELIANCE INSTRUMENTS IN CASES *Continued*

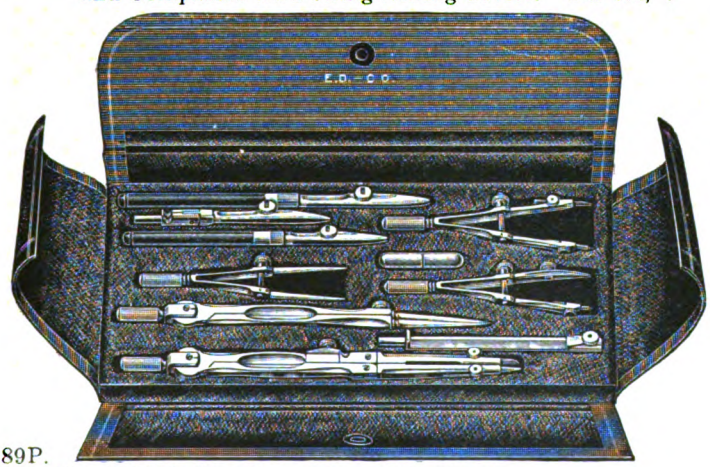
Of German Silver and Steel Points.



No. 1189.

No. 1189.
Cont'g: No. 1140 Ruling Pen, 4 in., spring blade.
1142 " " 5½ " " "
1144 Steel Spring Bow Dividers, 3¼ in., metal handle.
1145 " " " Pencil, 3¼ " " "
1146 " " " Pen, 3¼ " " "
1155 Hairspring Dividers, 6 in.
1156 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar.
Box with Leads Per set, ... $7 50

No. 1189S. Containing same assortment as No. 1189, but Dividers and Compasses with straightening device. Per set, . 7 70



No. 1189P.

No. 1189P.
Cont'g: No. 1140 Ruling Pen, 4 in., spring blade.
1142 " " 5½ " " "
1144, 1145, 1146, Steel Spring Bows, 3¼ in., metal handles.
1155 Hairspring Dividers, 6 in.
1156 Compasses, 6 in., with fixed needle point, pen, pencil point and lengthening bar.
Box with Leads. Per set, ... $7 90

No. 1189PS. Containing same assortment as No. 1189P, but Dividers and Compasses with straightening device. Per set, . 8 10

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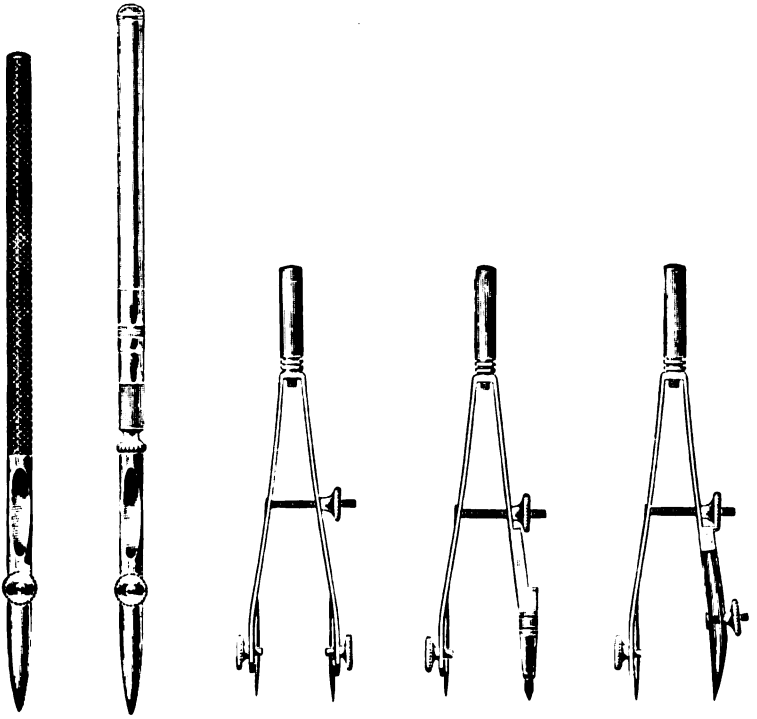
GERMAN SILVER SCHOLAR INSTRUMENTS

For Elementary School Grades.

A serviceable line of low-priced instruments. Made of German silver. Superior in every way to French brass or nickel-plated instruments.

For description of quality see page 72.



No. 1200. 1201. 1202. 1203. 1204.

No. 1200.	Ruling Pen, 5 in., metal handle, ...	Each, $0 15
1201.	" " 5½ " white bone handle and pin. .	" 33
1202.	Spring Bow Dividers, 3¼ in., metal handle, . .	" 70
1203.	" " Pencil, 3¼ " " " . . .	" 90
1204	" " Pen, 3¼ " " " . . .	" 90

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GERMAN SILVER SCHOLAR INSTRUMENTS *Continued*

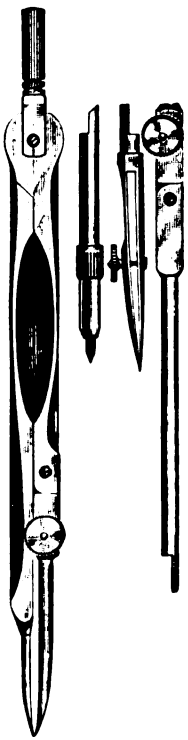
For Elementary School Grades.

For description of quality see page 72.

No. 1205.

1208.

1210.



1211.

No. 1205.	Dividers,	5¼ in., ...	Each, $0 42
1208.	Compasses,	5¼ " with pencil point, ...	" 65
1210.	"	5¼ " with pen and pencil point, .	" 85
1211.	"	5¼ " with pen, pencil point and lengthening bar, ...	" 98

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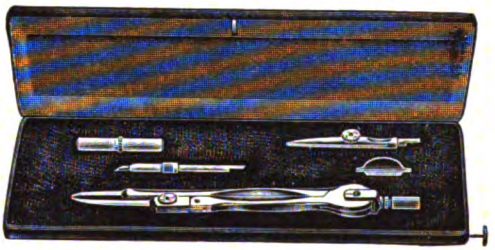
GERMAN SILVER SCHOLAR INSTRUMENTS

IN CASES

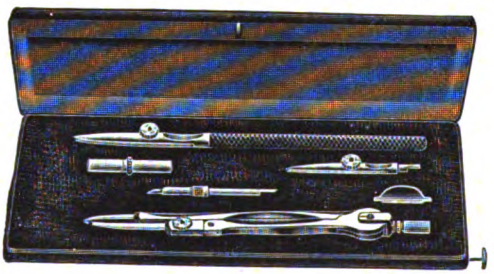
For Elementary School Grades.

For description of quality see page 72.



No. 1215.

No. 1215. Pocket Case, containing Compasses, 5¼ in., with pen and pencil points; Key and Lead Box. Per set, ... **$0 96**



No. 1217.

No. 1217. Pocket Case, containing Compasses, 5¼ in., with pen and pencil points; Ruling Pen, 5 in., metal handle; Key and Lead Box. Per set, ... **$1 15**

No. 1219.

No. 1219. Pocket Case, containing Compasses, 5¼ in., with pen, pencil point and lengthening bar; Ruling Pen, 5 in., metal handle; Key and Lead Box.
Per set, ... **$1 38**

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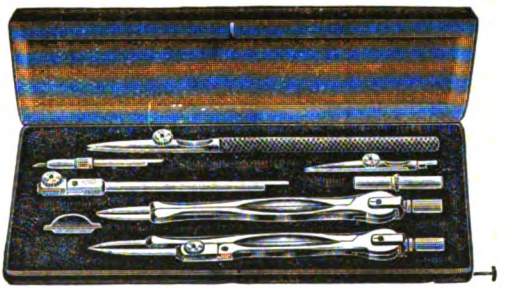
GERMAN SILVER SCHOLAR INSTRUMENTS *Continued*

IN CASES

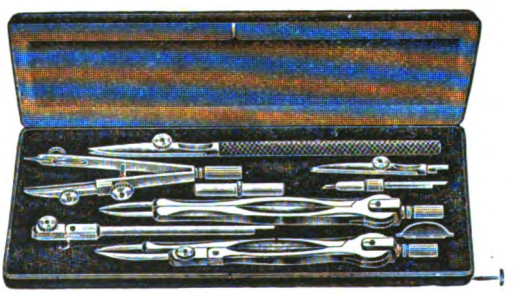
For Elementary School Grades.

For description of quality see page 72.



No. 1221.

No. 1221. Pocket Case, containing Compasses, 5¼ in., with pen, pencil point and lengthening bar; Dividers, 5¼ in.; Ruling Pen, 5 in., metal handle; Key and Lead Box. . . Per set, $1 65



No. 1223.

No. 1223. Pocket Case, containing Compasses, 5¼ in., with pen, pencil point and lengthening bar; Dividers, 5¼ in.; Spring Bow Pen, 3¼ in.; Ruling Pen, 5 in., metal handle; Key and Lead Box.

Per set, ... $2 50

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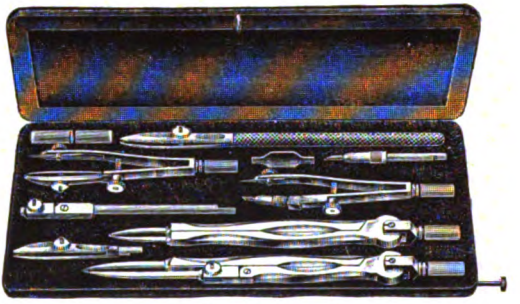
GERMAN SILVER SCHOLAR INSTRUMENTS *Continued*

IN CASES

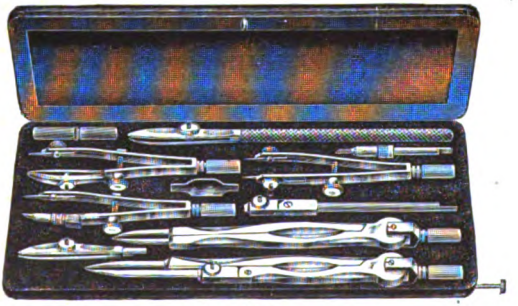
For Elementary School Grades.

For description of quality, see page 72.



No. 1225.

No. 1225. Pocket Case, containing Compasses, 5¼ in., with pen, pencil point and lengthening bar; Dividers, 5¼ in.; Spring Bow Pencil, 3¼ in.; Spring Bow Pen, 3¼ in.; Ruling Pen, 5 in., metal handle; Key and Lead Box. Per set, ... $3 45



No. 1227.

No. 1227. Pocket Case, containing Compasses, 5¼ in., with pen, pencil point and lengthening bar; Dividers, 5¼ in.; Spring Bow Dividers, 3¼ in.; Spring Bow Pencil, 3¼ in.; Spring Bow Pen, 3¼ in.; Ruling Pen, 5 in., metal handle; Key and Lead Box. Per set, ... $4 20

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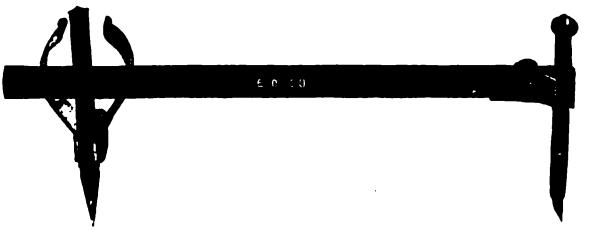
KNIGHT BEAM COMPASS



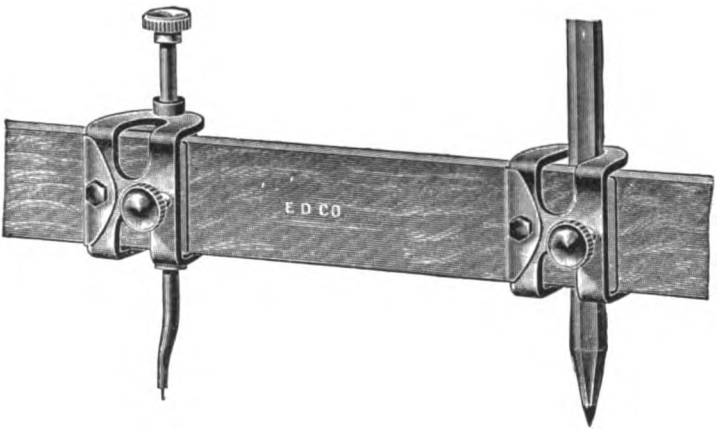
No. 1278.

No. 1278. Knight Beam Compass, with two steel bars for circles from 4 to 24 inches in diameter, ... Each, **$2 00**

1278½. Extra Steel Bar, 30 inches long, with spring carrier, for No. 1278, ... " 1 00

The Knight Beam Compass consists of two light steel bars, 7 inches and 13 inches long, for circles 4 to 24 inches, an eccentric needle-point part, and a spring carrier. The longer bar is divided into inches. By means of the eccentric needle-point part fine adjustments can be quickly obtained. The spring carrier is so constructed that it holds firmly any ruling pen or pencil; it can be instantly moved to any position on the bar, and the self-locking device holds it perfectly rigid.

ECONOMY BEAM COMPASS



No. 1280.

No. 1280. Economy Beam Compass, ... Each, **$2 00**

The Economy Beam Compass is of simple, novel construction; rigid, and easy to adjust. Made of dull nickel-plated steel; consists of a needle-point part with micrometer adjustment, and pen and pencil socket so constructed that an ordinary lead pencil or any pen part may be inserted.

The Bar is sold separately, see No. 2119–5.

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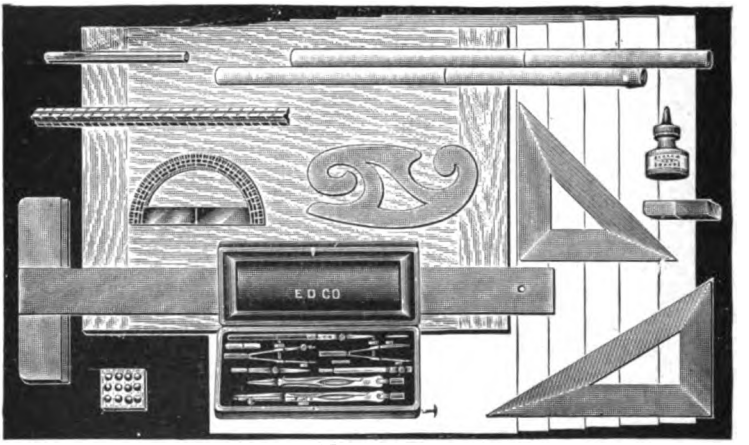
STUDENTS' DRAWING OUTFITS



No. 1287.

Outfits Nos. 1287, 1289, 1291 and 1293 are specially adapted for students taking the Engineering and Mechanical Drawing courses of Apprentice or Correspondence Schools. All materials composing these Outfits are of our regular stock, as listed and described in our catalogue, under the respective numbers given.

No. 1287. Consists of the following:

1 set German Silver Drawing Instruments, **No. 1225.**
1 Drawing Board, 16 x 22 in., pinewood, No. 2265.
1 T Square, 24 in., pearwood, No. 2071.
1 Protractor, 4½ in., brass, No. 1936.
1 Scale, 12 in., triangular, boxwood, No. 1626.
1 Triangle, 30° x 60°, 8 in., pearwood, No. 2006.
1 Triangle, 45°, 6 in., pearwood, No. 2007.
1 Irregular Curve, pearwood, No. 2150–16.
1 dozen Steel Tacks, ⅜ in., on card, No. 2441.
1 Drawing Pencil, Hyperion, 4H, No. 3200.
1 bottle of Ink, Dietzgen's Waterproof Black, No. **2681.**
1 Ink and Pencil Eraser, Dietzgen's No. 3365.
2 sheets Tracing Cloth, 15 x 20 in., Imperial, No. 135.
6 sheets Drawing Paper, 15 x 20 in., Cream, No. 12.
Outfit complete. . . . . Each, **$7 25**

No. 1289. Same Outfit as No. 1287, but with set of German Silver Drawing Instruments No. 1184 in place of set No. 1225, . Each, **$9 75**

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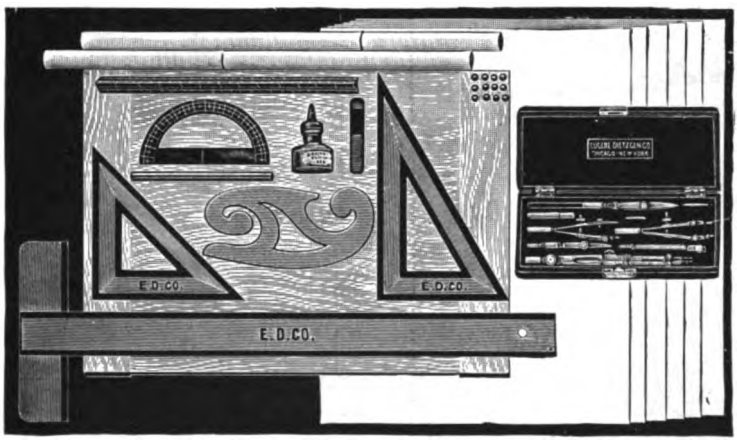

No. 1291.

No. 1291. Consists of the following:

1 special set of German Silver Drawing Instruments, in Morocco case, containing:

No. 947 Ruling Pen, 5½ in., with spring and ebony handle.
989 Steel Spring Bow Pencil, 3½ in., metal handle.
990 " " " Pen, 3½ " " "
1024 Compasses, 6 in., with fixed needle point, pen and pencil points, and lengthening bar.

2 extra Needle Points, one for Compasses and one for Bow Pencil. Box with Leads.
1 Drawing Board, 16 x 22 in., pinewood, No. 2265.
1 T Square, 24 in., mahogany and ebony-lined blade, No. 2079.
1 Protractor, 6 in., German Silver, No. 1941½.
1 Scale, 12 in., triangular, boxwood, No. 1626.
1 Triangle, 30° x 60°, 10-in., mahogany and ebony-lined, No. 2012.
1 Triangle, 45°, 8 in., magohany and ebony-lined, No. 2013.
1 Irregular Curve, pearwood, No. 2150-16.
1 dozen Steel Tacks, ⅜-inch, on card, No. 2441.
1 Drawing Pencil, Koh-i-noor, 4H, No. 3250.
1 bottle of Drawing Ink, Dietzgen's Waterproof Black, No. 2681
1 Ink and Pencil Eraser, Dietzgen's No 3365.
2 sheets Tracing Cloth, 15 x 20 in., Imperial, No. 135.
6 sheets Drawing Paper, 15 x 20 in., Whatman's, No. 1.

Outfit, complete, ... Each, $12 00

No. 1293. Same Outfit as No. 1291, but with Pivot-joint Compasses No. 913 in set of Instruments, in place of Compasses No. 1024. Each, $13 75

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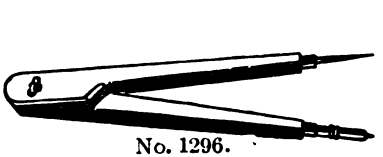
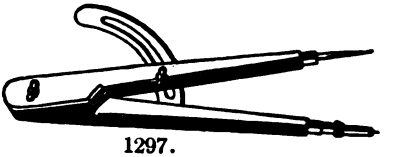
WOODEN BLACKBOARD DIVIDERS



No. 1296.

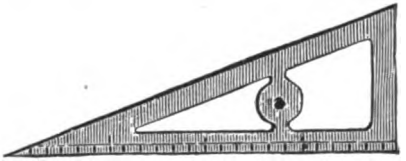


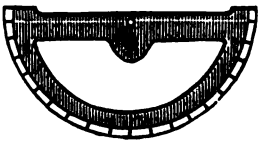
1297.

No. 1296. Wooden Blackboard Dividers, 15 in., . . . Each, $1 25
1297. " " " 18 " with arc, . " 2 00

WOODEN BLACKBOARD DRAWING SET

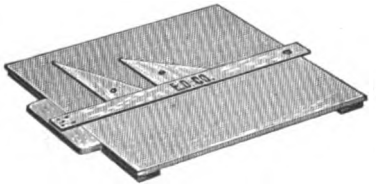
No. 1298.

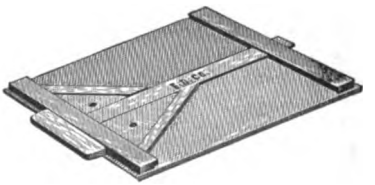




No. 1298. Wooden Blackboard Drawing Set, consisting of 24 in. T Square, 36 in. Straight Edge, 24 in. Triangle, all divided to inches, and 15½ in. Protractor, ... Per set, $5 00
1298A. T Square of above Set, ... Each, 1 25
1298B. Straight Edge " " . . . . . " 1 25
1298C. Triangle of " " . . . . . " 1 25
1298D. Protractor of " " . . . . . " 1 25

SCHOOL DRAWING OUTFIT





No. 1302.

No. 1302. School Drawing Outfit, 10 × 12 inches, ... Each, $0 45
1304. " " " 13 × 19 " . . . . . " 70
1306. " " " 17 × 22 " . . . . . " 1 10

The School Drawing Outfit consists of a well-made board, T square, and two triangles; the board is so constructed that when the T square and triangles are not in use they are held firmly to the under side of the board. It is compact, inexpensive and durable, and makes an excellent outfit for school, home, or traveling use.

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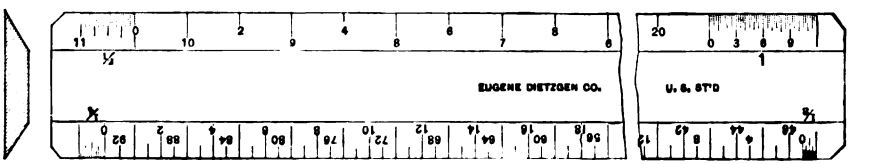
FLAT BOXWOOD SCALES

U. S. Standard. Machine Divided.

Flat Scales for general use are preferable to the triangular form, as they are easier to read, more convenient to use, and cost less to replace.

Special attention is given to the material and workmanship of all our scales; and for accuracy and finish they are unequaled by any other make. They are machine-divided, agree with the U. S. Standard, and are made of thoroughly seasoned boxwood.

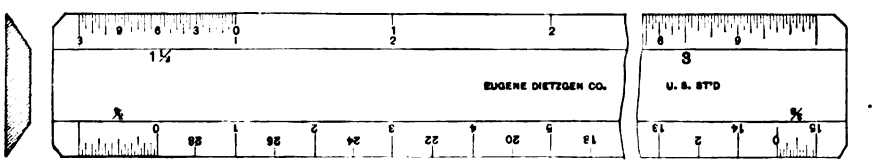


No. 1356.

Divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 inch to the foot.

No. 1351.	Flat Boxwood Scale,	6 in.,	. . . . .	Each,	$0 45
1356.	" " "	12 "	. . . . .	"	70
1357.	" " "	12½ "	. . . . .	"	80
1363.	" " "	18 "	. . . . .	"	1 35
1366.	" " "	24 "	. . . . .	"	1 75

No. 1357 covers 100 feet on $\frac{1}{8}$ in., 50 feet on $\frac{1}{4}$ in., and 25 feet on $\frac{1}{2}$ inch scale.



No. 1376.

Divided: $\frac{3}{8}$, $\frac{3}{4}$, 1½, 3 inches to the foot.

No. 1371.	Flat Boxwood Scale,	6 in.,	. . . . .	Each,	$0 45
1376.	" " "	12 "	. . . . .	"	70
1381.	" " "	18 "	. . . . .	"	1 35
1386.	" " "	24 "	. . . . .	"	1 75

If Special Scales are ordered, a sketch showing divisions and numbering is required, and a remittance covering entire cost, figured at double list price of regular scales of the same kind.

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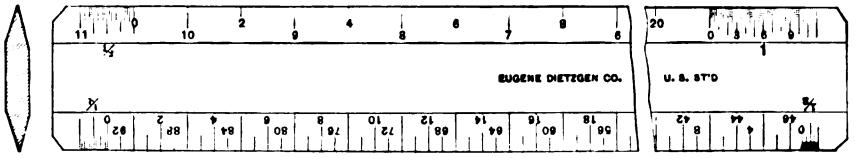
FLAT BOXWOOD SCALES *Continued*

U. S. Standard. Machine Divided.

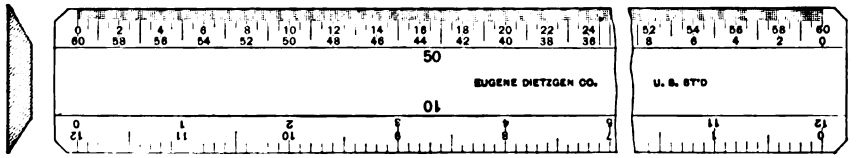


No. 1396.

Divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, $1\times\frac{3}{8}$, $\frac{3}{4}$, $1\frac{1}{2}$, 3 inches to the foot.

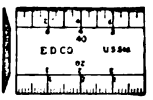
		Each.
No. 1394.	Flat Boxwood Scale, 6 in., both sides beveled and divided, .	$0 80
1396.	" " " 12 " " " " " " "	1 10
1398.	" " " 18 " " " " " " "	2 15
1400.	" " " 24 " " " " " " "	2 90

CHAIN SCALES



No. 1426.

		Each.
No. 1420.	Flat Boxwood Chain Scale, 6 in., div. 10×50 parts to the inch,	$0 45
1421.	" " " " 6 " " 20×40 " "	45
1422.	" " " " 6 " " 30×60 " "	45
1423.	" " " " 6 " " 80×100 " "	70
1426.	" " " " 12 " " 10×50 " "	70
1427.	" " " " 12 " " 20×40 " "	70
1428.	" " " " 12 " " 30×60 " "	70
1429.	" " " " 12 " " 80×100 " "	1 10



No. 1431.

		Each.
No. 1430.	Flat Boxwood Offset Scale, 2 in., div. 10×50 parts to the inch,	$0 40
1431.	" " " " 2 " " 20×40 " "	40
1432.	" " " " 2 " " 30×60 " "	40
1433.	" " " " 2 " " 80×100 " "	65

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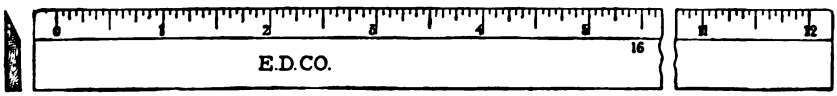
FLAT BOXWOOD SCALES *Continued*

ONE EDGE BEVELED, WITH BUT ONE DIVISION ON EACH SCALE.

U. S. Standard. Machine Divided.

These Scales were designed to overcome the objectionable features of scales with various divisions, which have the tendency to present the wrong scale, necessitating a loss of time in finding the required division.

They are made of the best seasoned boxwood, with the same care as the more expensive scales, and are somewhat narrower than the regular flat scales.



No. 1439.—12 in long, divided to $\frac{1}{16}$ in.

Architects' Scales, div., either $\frac{3}{32}$, $\frac{3}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, 1½, 2, 3, 4, 6 in. to the foot.
Engineers' " " " 10, 20, 30, 40, 50, 60, 80, 100 parts to the inch.

No. 1439.	Single Scale, 12 in., divided to $\frac{1}{16}$ in., ...	Each,	$0 20
1440.	" " 12 " division as selected (excepting 80 or 100 parts to the inch), ...	"	20
1442.	Single Scale, 12 in., divided either 80 or 100 parts to the inch, ...	"	30
1444.	Per set of 4 Scales, in case, divisions as selected, .	"	1 70
1445.	" 8 " " " " . .	"	2 75
1446.	" 12 " in polished wooden box, lined with felt and stamped with divisions, as selected, . .	"	4 00

In ordering above, please state divisions wanted.

SECOND QUALITY FLAT BOXWOOD SCALES

For School Use, Etc.

No. 1448.	Flat Boxwood Scale, 6 in., div. $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 in. to the foot,	Each,	$0 30
1449.	" " " 12 " " $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 " " " "		50

MISCELLANEOUS GRADUATIONS

No. 1450.	Flat Boxwood Scale, 12 in., div. $\frac{1}{2}\times 1$ in. to the foot,	Each,	$0 70
1451.	" " " 12 " " $\frac{1}{4}\times\frac{1}{8}$ " " " "	"	70
1452.	" " " 12 " " $\frac{1}{16}$ in. $\times\frac{1}{4}$, $\frac{1}{8}$ in. to the foot,	"	70
1453.	" " " 12 " " 10 × 16 parts to the inch,	"	70
1454.	" " " 12 " " $\frac{1}{8}$, $\frac{1}{4}\times\frac{3}{8}$, $\frac{3}{4}$ in. to the foot,	"	70
1455.	" " " 12 " " $\frac{1}{8}$, $\frac{1}{4}\times\frac{3}{4}$, 1$\frac{1}{2}$ " " " "	"	70
1456	" " " 12 " " 16 × 32 parts to the inch,	"	70
1457.	" " " 12 " " 16th in. × m m., . .	"	70

If special Scales are ordered, a sketch showing divisions and numbering is required, and a remittance covering entire cost, figured at double list price of regular Scales of the same kind.

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FLAT BOXWOOD SCALES *Continued*

METRIC SCALES

U. S. Standard. Machine Divided.

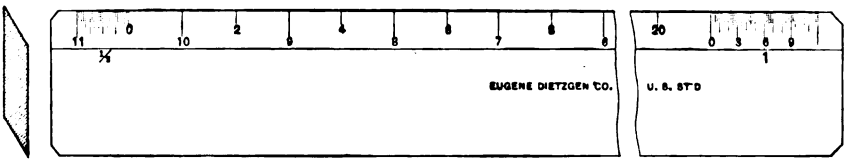
No. 1460.	Flat Boxwood Metric Scale, 10 cm., div. mm. × half mm., Each,	$0	50
1462.	" " " " 20 " " " " " "		60
1464.	" " " " 30 " " " " " "		75
1466.	" " " " 50 " " " " " "	1	40

INCH AND METRIC COMPARING SCALES

No. 1468.	Flat Boxwood Inch and Metric Comparing Scale (not beveled), 30 cm., divided mm. × 16th in., on median line, Each,	$0	90
1469.	Flat Boxwood Scale, like No. 1468, but 50 cm., . . "	1	80

OPPOSITE BEVEL BOXWOOD SCALES

These Scales are an improvement over the regular flat shape, as they may be picked up more readily, and present but one graduated bevel to the eye when in use.



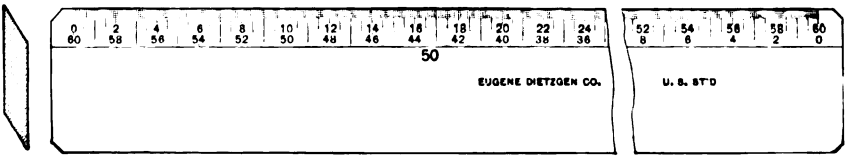
No. 1471.

Divided: $\frac{1}{8}$, $\frac{1}{4}$, × $\frac{1}{2}$, 1 inch to the foot.

No. 1470.	Opposite Bevel Boxwood Scale, 6 in., ... Each,	$0	45
1471.	" " " " 12 " . . . . "		70

Divided: $\frac{3}{8}$, $\frac{3}{4}$ × $1\frac{1}{2}$, 3 inches to the foot.

No. 1474.	Opposite Bevel Boxwood Scale, 6 in., ... Each,	$0	45
1475.	" " " " 12 " . . . . "		70



No. 1485.

Chain Scale.—Divided: 10 × 50 parts to the inch.

No. 1480.	Opposite Bevel Boxwood Chain Scale, 6 in., . . Each,	$0	45
1485.	" " " " " 12 " . . "		70

If Special Scales are ordered, a sketch showing divisions and numbering is required, and a remittance covering entire cost, figured at double list price of regular Scales of the same kind.

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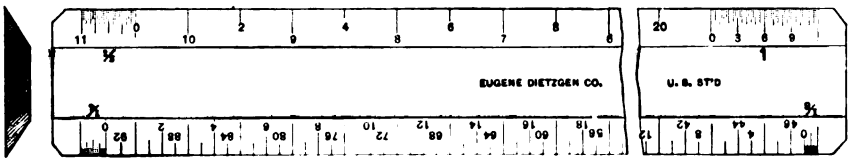
FLAT WHITE EDGE SCALES

U. S. Standard. Machine Divided.

Our White Edge Scales are made of carefully selected, thoroughly seasoned boxwood, with inlaid celluloid facings upon which the divisions are machine-graduated. They are accurate and durable; the divisions clear and sharp.

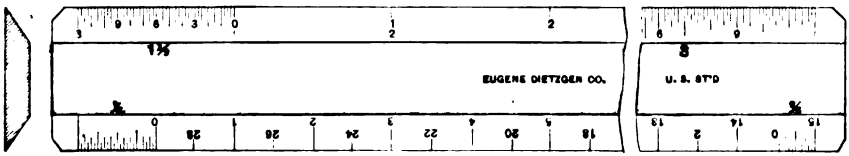


No. 1509.

Divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 inch to the foot.

No. 1508.	Flat White Edge Scale, 6 in., ...	Each,	$0 70
1509.	" " " " 12 "	"	1 15
1511.	" " " " 12½"	"	1 25
1512.	" " " " 18 "	"	2 10
1513.	" " " " 24 "	"	2 75

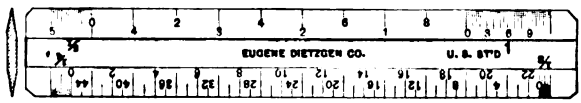
No. 1511 covers 100 ft. on $\frac{1}{8}$ in., 50 ft. on $\frac{1}{4}$ in. and 25 ft. on $\frac{1}{2}$ in. scale.



No. 1517.

Divided: $\frac{3}{8}$, $\frac{3}{4}$, $1\frac{1}{2}$, 3 inches to the foot.

No. 1516.	Flat White Edge Scale, 6 in., ...	Each,	$0 70
1517.	" " " " 12 "	"	1 15
1518.	" " " " 18 "	"	2 10
1519.	" " " " 24 "	"	2 75



No. 1526.

Divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 × $\frac{3}{8}$, $\frac{3}{4}$, $1\frac{1}{2}$, 3 inches to the foot.

No. 1526.	Flat White Edge Scale, 6 in., both sides beveled and divided, in leather sheath, less than one inch wide; very convenient for the pocket, ...	Each,	$1 35
1527.	Flat White Edge Scale, 12 in., both sides bev. and div.,	"	2 00
1528.	" " " " 18 " " " " " " " "	"	3 40
1529.	" " " " 24 " " " " " " " "	"	4 60

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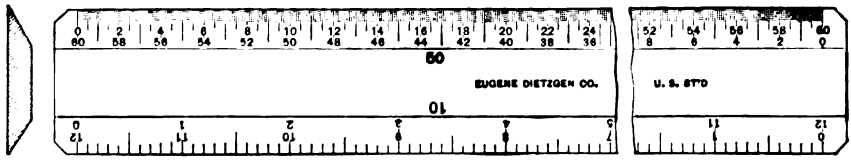
FLAT WHITE EDGE SCALES *Continued*

U. S. Standard. Machine Divided.



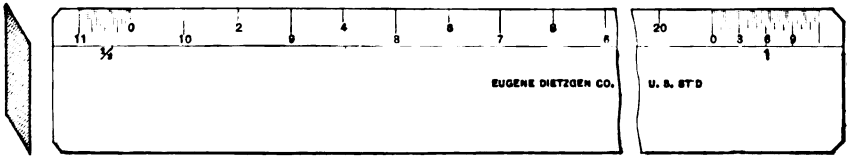
No. 1546.

			Each.
No. 1541.	Flat White Edge Chain Scale, 6 in., div.	10×50 parts to in.	$0 70
1542.	" " " " " 6 " "	20×40 " "	70
1543.	" " " " " 6 " "	30×60 " "	70
1544.	" " " " " 6 " "	80×100 " "	90
1546.	" " " " " 12 " "	10×50 " "	1 15
1547.	" " " " " 12 " "	20×40 " "	1 15
1548.	" " " " " 12 " "	30×60 " "	1 15
1549.	" " " " " 12 " "	80×100 " "	1 50

FOOT DIVIDED DECIMALLY.

			Each.
No. 1550.	Flat White Edge Chain Scale, 12 in., div.	100×500 parts to ft.	$1 25
1551.	" " " " " 12 " "	200×400 " "	1 25
1552.	" " " " " 12 " "	300×600 " "	1 25
1553.	" " " " " 12 " "	800×1000 " "	1 75
1556.	Flat White Edge Chain Scale, 6 in., both sides beveled and divided, 10 × 40 and 30 × 50 parts to the in., in leather sheath, less than one in. wide, ...	Each,	$1 35

OPPOSITE BEVEL WHITE EDGE SCALES



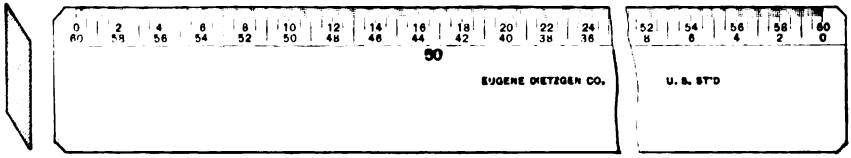
No. 1562.

Divided: $\frac{1}{8}$, $\frac{1}{4}\times\frac{1}{2}$, 1 inch to the foot.

No. 1561.	Opposite Bevel White Edge Scale, 6 in., ...	Each,	$0 70
1562.	" " " " " 12 "	"	1 15

Divided: $\frac{3}{8}$, $\frac{3}{4}\times 1\frac{1}{2}$, 3 inches to the foot.

No. 1566.	Opposite Bevel White Edge Scale, 6 in., ...	Each,	$0 70
1567.	" " " " " 12 "	"	1 15



No. 1572.

Chain Scale.—Divided: 10 × 50 parts to the inch.

No. 1571.	Opposite Bevel White Edge Chain Scale, 6 in., .	Each,	$0 70
1572.	" " " " " " 12 " ,	"	1 15

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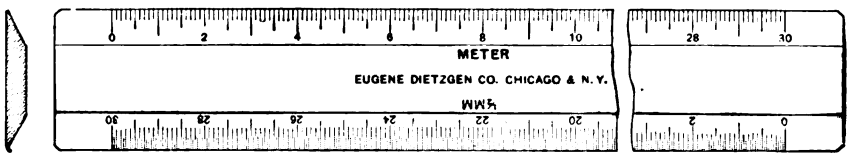
FLAT WHITE EDGE SCALES *Continued*

U. S. Standard. Machine Divided.

MISCELLANEOUS GRADUATIONS

			Each.
No. 1573A.	Flat White Edge Scale, 12 in., div.	$\frac{1}{2}\times 1$ in. to the foot,	$1 15
1573B.	" " " " 12 " "	$\frac{1}{4}\times\frac{1}{8}$ " " "	1 15
1573C.	" " " " 12 " "	$\frac{1}{16}$ in $\times\frac{1}{4},\frac{1}{8}$ in. to the ft.	1 15
1573D.	Opposite Bevel W. E. " 12 " "	$\frac{1}{16}$ " $\times\frac{1}{4},3$ " " "	1 1
1573E.	Flat White Edge " 12 " "	10×16 parts to the inch,	1 15
1573F.	" " " " 12 " "	$\frac{1}{8},\frac{1}{4}\times\frac{3}{8},\frac{3}{4}$ in. to the foot,	1 15
1573G.	" " " " 12 " "	$\frac{1}{8},\frac{1}{4}\times\frac{3}{4},1\frac{1}{2}$ " " "	1 15
1573H.	" " " " 12 " "	16×32 parts to the inch,	1 15

METRIC SCALES



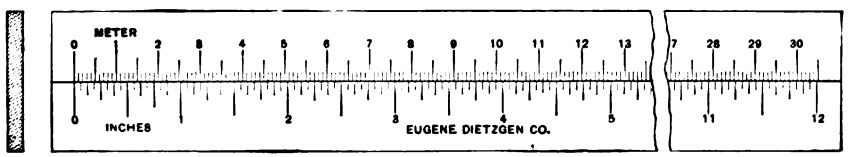
No. 1574C.

			Each.
No. 1574A.	Flat White Edge Metric Scale, 10 cm., div. mm. and half mm.		$0 75
1574B.	" " " " 20 " " " " " "		1 00
1574C.	" " " " 30 " " " " " "		1 25
1574D.	" " " " 50 " " " " " "		2 25

INCH AND METRIC SCALES

No. 1575A. Flat White Edge Scale, 30 cm. div. $\frac{1}{32}$ in. $\times$ half mm., Each, $1 50.
1575B. " " " " 50 " " " " " " " 2 40

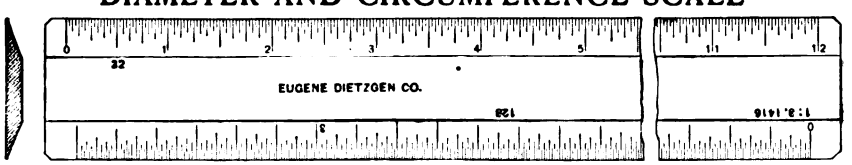
These scales are very convenient for converting plans from one system into the other.



No. 1576A.

No. 1576A. Flat Inch and Metric Comparing Scale, white facing (not beveled), 30 cm., divided mm. $\times$ 16th. in., on median line, ... Each, $1 50
1576B. Flat Scale, like No. 1576A, but 50 cm., ... " 2 50

DIAMETER AND CIRCUMFERENCE SCALE



No. 1577.

No. 1577. Flat White Edge Scale, 12 in., divided for diameter and circumference, ... Each, $1 75

The divisions on this scale are in the ratio of diameter to circumference of a circle; one edge is divided in inches to 32nds., the other to spaces 3.1416 in. to 128ths.

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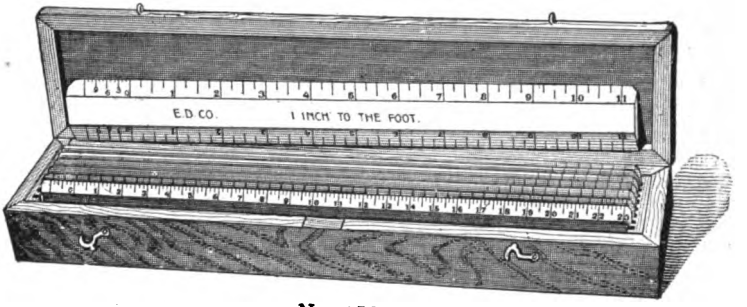
FLAT BOXWOOD SCALES IN SETS

U. S. Standard. Machine Divided.



No. 1581.

Nos. 1580 to 1582 have the same scale on both edges; one edge is divided and figured to read from left to right, and the other from right to left.

No. 1580. Set of 4 Boxwood Scales, 12 in.
Divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 inch to the foot, ... Per set, $4 25

1581. Set of 8 Boxwood Scales, 12 in.
Divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 inches to the foot, . " 7 50

1582. Set of 12 Boxwood Scales, 12 in.
Divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 2, 3, 4, 6 and 12 inches to the foot, ... " 11 00

Nos. 1586 and 1587 have a different scale on each edge, each of which is figured to read both ways.

No. 1586. Set of 4 Boxwood Scales, 12 in.
Divided: 10 and 50, 20 and 40, 30 and 60, 80 and 100 parts to the inch, ... Per set, $4 70

1587. Set of 8 Boxwood Scales, 4 12 in. and 4 2 in. Offset to match.
Divided: 10 and 50, 20 and 40, 30 and 60, 80 and 100 parts to the inch, ... " 7 25

Nos. 1590 and 1591 have the same scale on both edges, each edge is figured to read both ways.

No. 1590. Set of 6 Boxwood Scales, 12 in.
Divided: 10, 20, 30, 40, 50, 60 parts to the inch, . Per set, $6 00

1591. Set of 8 Boxwood Scales, 12 in.
Divided: 10, 20, 30, 40, 50, 60, 80, 100 parts to the inch, " 9 00

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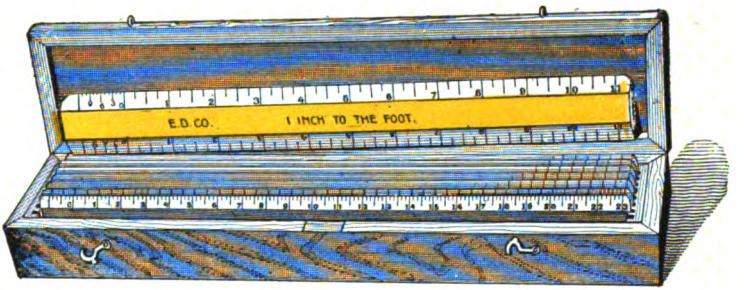
FLAT WHITE EDGE SCALES IN SETS

U. S. Standard. Machine Divided.



No. 1596.

Nos. 1595 to 1597 have the same scale on both edges; one edge is divided and figured to read from left to right, and the other from right to left.

No. 1595. Set of 4 White Edge Scales, 12 in.
Divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 inch to the foot, ... Per set, **$6 25**

1596. Set of 8 White Edge Scales, 12 in.
Divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 inches to the foot, . " **11 50**

1597. Set of 12 White Edge Scales, 12 in.
Divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 2, 3, 4, 6 and 12 inches to the foot, ... " **17 00**

No. 1601 has a different scale on each edge, each of which is figured to read both ways.

No. 1601. Set of 4 White Edge Scales, 12 in.
Divided: 10 and 50, 20 and 40, 30 and 60, 80 and 100 parts to the inch, ... Per set, **$6 75**

Nos. 1605 and 1606 have the same scale on both edges; each edge is figured to read both ways.

No. 1605. Set of 6 White Edge Scales, 12 in.
Divided: 10, 20, 30, 40, 50, 60 parts to the inch, . Per set, **$9 00**

1306. Set of 8 White Edge Scales, 12 in.
Divided: 10, 20, 30, 40, 50, 60, 80, 100 parts to the inch, " **13 00**

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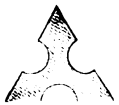
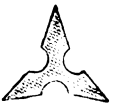
TRIANGULAR BOXWOOD SCALES

FOR ARCHITECTS AND MECHANICAL ENGINEERS.



Regular Shape.

U. S. Standard. Machine Divided.



Relieved Facet Shape.

For explanation of **Regular** and **Relieved Facet Shape** Scales, see next page.

No. 1626.

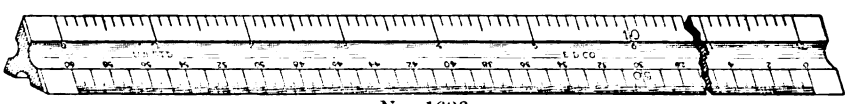
Divided: $\frac{3}{32}$, $\frac{3}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 in. to the foot, $\frac{1}{16}$ in.

No. 1625.	Triangular Boxwood Scale,	6 in.,	**Regular Shape,**	Each,	$0	50
1626.	" " "	12 "	" " "			75
1627.	" " "	18 "	" " "		2	40
1628.	" " "	24 "	" " "		4	20
1626B.	" " "	12 "	**Relieved Facet Shape,**		1	20

Divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 2, 3, 4 in. to the foot, $\frac{1}{16}$ in.

No. 1631.	Triangular Boxwood Scale,	12 in.,	**Regular Shape,**	Each,	$0	75
1632.	" " "	18 "	" " "		2	40
1633.	" " "	24 "	" " "		4	20
1631B.	" " "	12 "	**Relieved Facet Shape,**		1	20

FOR CIVIL ENGINEERS AND SURVEYORS.



No. 1636.

Divided: 10, 20, 30, 40, 50, 60 parts to the inch.

							Each.
No. 1635.	Triangular Boxwood Chain Scale,	6 in.,	**Regular Shape,**				$0	50
1636.	" " " "	12 "	" "					75
1637.	" " " "	18 "	" "				2	40
1638.	" " " "	24 "	" "				4	20
1636B.	" " " "	12 "	**Relieved Facet Shape,**				1	20

Divided: 20, 30, 40, 50, 60, 80 parts to the inch.

							Each.
No. 1640.	Triangular Boxwood Chain Scale,	12 in.,	**Regular Shape,**				$0	90
1641.	" " " "	18 "	" "				2	40
1642.	" " " "	24 "	" "				4	20
1643.	" " " "	12 "	divided: 100,					
	200, 300, 400, 500, 600 parts to the foot,	**Regular Shape,**					1	50

TRIANGULAR BOXWOOD METRIC SCALES

Divided: .01, .02, .03, .05, .025 and .0125.

No. 1647.	Triangular Boxwood Scale,	20 cm.,	**Regular Shape,**	Each,	$1	20
1648.	" " "	30 "	" " "		1	50
1649.	" " "	50 "	" " "		2	70

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TRIANGULAR WHITE EDGE SCALES

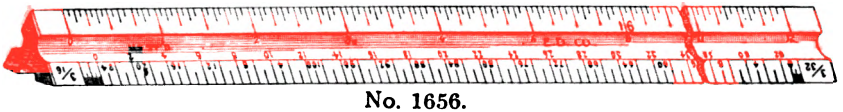
U. S. Standard. Machine Divided.

Regular Shape.

Our Triangular White Edge Scales are made in two styles—the **Regular** shape and the **Relieved Facet** shape—as shown in illustrations. On the Regular shape Scales the full surface of both facets are in contact with the drawing, affording a greater wearing surface, and will obviously not obliterate the divisions on the edges as quickly as on the Relieved Facet shape. On the latter style, however, the visual angle is such that it affords an easier reading of the scales, and as each style, therefore, has its advantages, we leave the selection to the taste of the purchaser.

Relieved Facet Shape

FOR ARCHITECTS AND MECHANICAL ENGINEERS.



No. 1656.

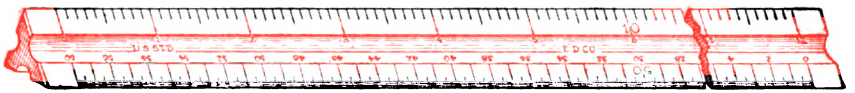
Divided: $\frac{3}{32}$, $\frac{3}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 in. to the foot, $\frac{1}{16}$ in.

		Each.
No. 1655.	Triangular White Edge Scale, 6 in., **Regular Shape,**	$1 50
1656.	" " " " 12 " " " "	2 40
1657.	" " " " 18 " " " "	4 50
1658.	" " " " 24 " " " "	6 50
1655B.	" " " " 6 " **Relieved Facet Shape,**	1 50
1656B.	" " " " 12 " " " "	2 40
1657B.	" " " " 18 " " " "	4 50
1658B.	" " " " 24 " " " "	6 50

Divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 2, 3, 4 in. to the foot, $\frac{1}{16}$ in.

No. 1661.	Triangular White Edge Scale, 12 in., **Regular Shape,**	$2 40
1662.	" " " " 18 " " " "	4 50
1663.	" " " " 24 " " " "	6 50
1661B.	" " " " 12 " **Relieved Facet Shape,**	2 40
1662B.	" " " " 18 " " " "	4 50
1663B.	" " " " 24 " " " "	6 50

FOR CIVIL ENGINEERS AND SURVEYORS.



No. 1667.

Divided: 10, 20, 30, 40, 50, 60 parts to the inch.

		Each.
No. 1665.	Triangular White Edge Chain Scale, 6 in. **Regular Shape,**	$1 50
1667.	" " " " " 12 " " "	2 40
1668.	" " " " " 18 " " "	4 50
1669.	" " " " " 24 " " "	6 50
1665B.	" " " " " 6 " **Relieved Facet Shape,**	1 50
1667B.	" " " " " 12 " " " "	2 40
1668B.	" " " " " 18 " " " "	4 50
1669B.	" " " " " 24 " " " "	6 50
1681.	Triangular White Edge Chain Scale, 12 in., divided: 20, 30, 40, 50, 60, 80 parts to the inch, **Regular Shape,**	2 50
1681B.	Triangular Scale, like No. 1681 but **Relieved Facet Shape,**	2 50
1682.	Triangular White Edge Chain Scale, 12 in., divided: 100, 200, 300, 400, 500, 600 parts to the foot, **Regular Shape,**	2 50
1682B.	Triangular Scale, like No. 1682 but **Relieved Facet Shape,**	2 50

Triangular Scales with any other divisions made to order.

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TRIANGULAR METALLIC SCALES

Regular Shape.

No. 1685.

No. 1685. Triangular Metallic Scale, Architects', 12 in., divided: $\frac{3}{32}$, $\frac{3}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 in. to the foot, $\frac{1}{16}$ in., . . Each, $2 50

1686. Triangular Metallic Chain Scale, Engineers', 12 in., divided: 10, 20, 30, 40, 50, 60 parts to the inch, . . " 2 50

1687. Triangular Metallic Chain Scale, Engineers', 12 in., divided: 20, 30, 40, 50, 60, 80 parts to the inch, . . " 2 50

Relieved Facet Shape.

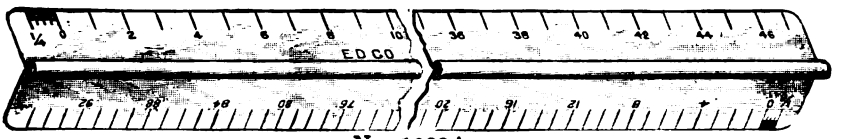
No. 1688B.

These Metallic Scales, besides having the Relieved Facet shape which affords an easier reading of the scales, have the three fillets colored respectively black, yellow and red, to facilitate finding the required division.

No. 1688A. Improved Triangular Metallic Scale, Architects', 12 in., divided: $\frac{3}{32}$, $\frac{3}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 in. to the foot, $\frac{1}{16}$ in., . . Each, $3 00

1688B. Improved Triangular Metallic Scale, Engineers', 12 in., divided: 10, 20, 30, 40, 50, 60 parts to the inch, . . " 3 00

1688C. Improved Triangular Metallic Scale, Engineers', 12 in., divided: 20, 30, 40, 50, 60, 80 parts to the inch, . . " 3 00



No. 1689A.

The form of these scales makes them very convenient for many purposes. They are made of steel, nickeled, with a dull finish; a 12 inch scale weighs 2½ ounces. Each scale has two graduations, one on each edge.

No. 1689A. Metal Scale, 12 in., div. $\frac{1}{8} \times \frac{1}{4}$ in. to the foot, . . Each, $1 25

1689B. " " 12 " " $\frac{1}{4} \times \frac{1}{2}$ " " " . . " 1 25

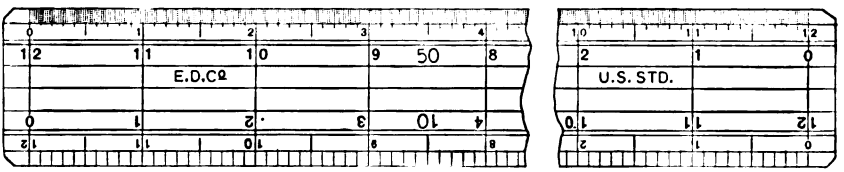
1689C. " " 12 " " $\frac{3}{8} \times \frac{3}{16}$ " " " . . " 1 25

1689D. " " 12 " " $\frac{1}{2} \times 1$ " " " . . " 1 25

1689E. " " 12 " " $\frac{3}{4} \times 1\frac{1}{2}$ " " " . . " 1 25

1689F. " " 12 " " $1\frac{1}{2} \times 3$ " " " . . " 1 25

UNDERWRITER'S SCALE



No. 1689L.

No. 1689K. Flat Transparent Ambro Underwriter's Scale, 6 in., both edges beveled and divided 10 × 50 parts to the inch. Each, $1 50

1689L. Flat Underwriter's Scale, like No. 1689K, but 12 inch, " 2 00

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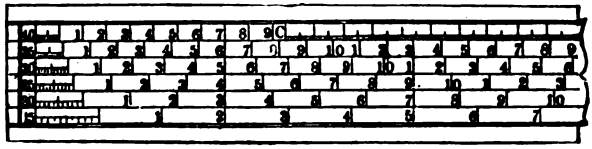
PLOTTING SCALES



No. 1690.

No. 1690.	Boxwood Plotting Scale, 6 in., ...	Each,	$0 15
1691.	Ivory Plotting Scale, 6 in., ...	"	85

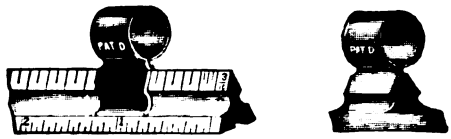
PAPER SCALES

Printed on Bristol Board. Engine Divided.

No. 1700.

No. 1700.	Card-board Scales, 18 in. long, full divided in $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 inches to the foot, . . . Per set of these 8 scales,		$1 50
	Single Scales, ...	Each,	20
1704.	Card-board Scales, 18 in. long, full divided in 10, 20, 30, 40, 50, 60 parts to the inch, . . . Per set of these 6 scales,		1 10
	Single Scales, ...	Each,	20
1706.	Metric Paper Scales, $\frac{1}{2}$ meter long, divided in mm, .	"	20
1708.	Metric and Inch Comparing Scale, $\frac{1}{4}$ meter long, . .	"	30
1710.	Scale of Proportional Inches, 12 in., long, div. $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{1}{1}$,	"	10

TRIANGULAR SCALE GUARDS



No. 1715.

No. 1715.	Triangular Scale Guard, nickel plated, ...	Each,	$0 15

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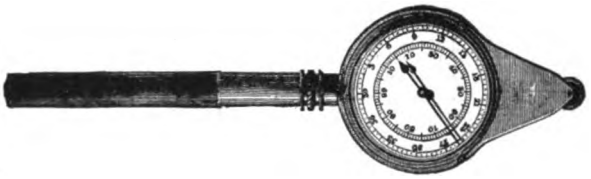
MAP MEASURES



No. 1720.

No. 1720. Universal Map Measure, with handle. The index hand registers inches to miles, or centimeters to kilometers, Each, $3 00

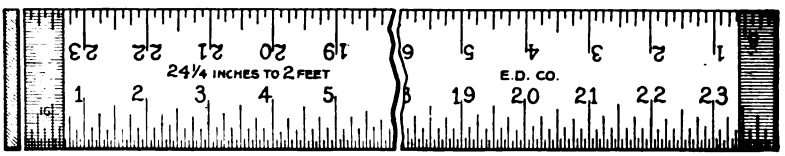
No. 1721.

No. 1721. Map Measure, watch pattern, dial with 2 graduations: 12 inches in eighths, and 25 feet marked every foot, ... Each, $2 15

To measure a line, first set the instrument to O, then, holding the instrument vertically, follow the line carefully in one direction by the small projecting tracer wheel. The length of the line in feet, inches and eighths will be indicated by the index hands on the dial.

SHRINKAGE RULES

FOR SINGLE AND DOUBLE SHRINKAGE



No. 1726.

These rules are of hardwood, brass tipped, about 1½ inches wide by ⅛ inch thick and divided to ⅛, 1/10, 1/12 and 1/16 inches.

No. 1725.	Shrinkage Rule,	24 3/10	equal	24	inches,	Each,	$1 20
1726.	" "	24 1/4	"	24	"	"	1 20
1727.	" "	24 3/8	"	24	"	"	1 20
1728.	" "	24 1/2	"	24	"	"	1 20

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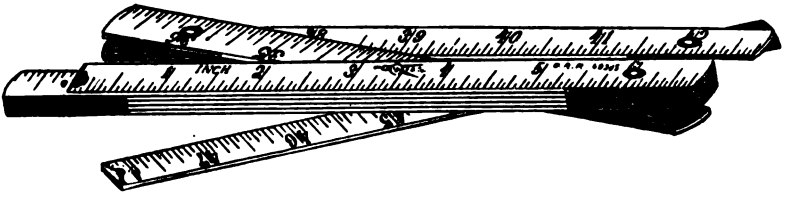
ENGINEERS' FOLDING POCKET RULES

Yellow Finish.



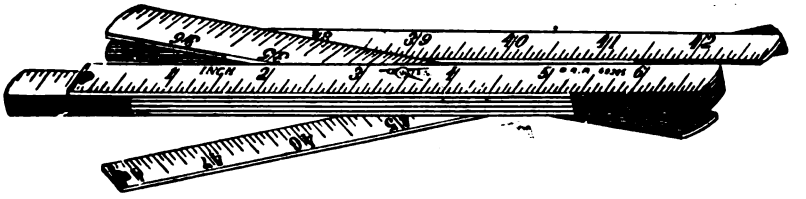
No 1738-4.

These Pocket Rules are thin and light, and therefore more convenient than the common joint Rules. By a peculiar preparation of the wood, shrinkage is entirely prevented. They are accurate and are provided with ingenious springs which hold the Rule in a straight line when open, for easy measurement of vertical and horizontal distances. The ends are provided with brass tips.

								Each.
No. 1738-2.	Pocket Rule,	2	feet,	4	fold,	div.	1/16×1/16 in., with springs,	$0 20
1738-3.	" "	3	"	6	"	"	1/16×1/16 " " "	25
1738-4.	" "	4	"	8	"	"	1/16×1/16 " " "	38
1738-5.	" "	5	"	10	"	"	1/16×1/16 " " "	47
1738-6.	" "	6	"	12	"	"	1/16×1/16 " " "	58
1738-8.	" "	8	"	16	"	"	1/16×1/16 " " "	75
1738-M.	" "	4	"	8	"	"	1/16×mm., " "	38

EXTRA FINE QUALITY.

Yellow Finish.



No. 1741-4.

No rivets visible on the surface that disturb the reading of the scale. The ends are provided with brass tips.

								Each.
No. 1741-2.	Pocket Rule,	2	feet,	4	fold,	div.,	1/16×1/16 in., with springs,	$0 22
1741-3	" "	3	"	6	"	"	1/16×1/16 " " "	30
1741-4.	" "	4	"	8	"	"	1/16×1/16 " " "	42
1741-5.	" "	5	"	10	"	"	1/16×1/16 " " "	50
1741-6.	" "	6	"	12	"	"	1/16×1/16 " " "	65
1741-8.	" "	8	"	16	"	"	1/16×1/16 " " "	85
1741-M.	" "	4	"	8	"	"	1/16×mm., " "	42
1741T-4.	" "	4	"	8	"	"	1/16×1/100 ft., " "	42
1741T-6.	" "	6	"	12	"	"	1/16×1/100 " " "	65

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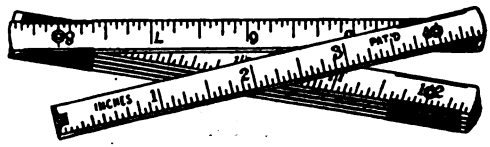
FOLDING POCKET RULES *Continued*

VEST POCKET SIZE



No. 1743-2.

YELLOW FINISH.

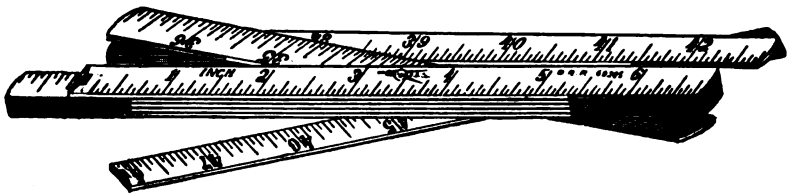
No. 1743-2.	Pocket Rule, 2 feet, 6 fold, $\frac{1}{16} \times \frac{1}{16}$ in., with springs,	Each,	$0 25
1743-3.	" " 3 " 9 " $\frac{1}{16} \times \frac{1}{16}$ " " " "		40
1743-M.	" " 1 meter, 10 " $\frac{1}{16} \times$ mm. " " " "		55

WHITE ENAMELED.

No. 1744-2.	Pocket Rule, 2 feet, 6 fold, $\frac{1}{16} \times \frac{1}{16}$ in., with springs,	Each,	$0 45
1744-3.	" " 3 " 9 " $\frac{1}{16} \times \frac{1}{16}$ " " " "		55
1744-M.	" " 1 meter, 10 " $\frac{1}{16} \times$ mm. " " " "		70

Rules Nos. 1743–1744 are only $\frac{3}{8}$ in. wide. The 3-foot Rule measures only $\frac{3}{8} \times \frac{9}{16} \times 5$ inches when closed. Very convenient for the pocket.

WHITE ENAMELED



No. 1745-4.

These Folding Pocket Rules are similar in construction to those listed under No. 1741, differing only in the finish. They have a white coating which is very durable and resists heat or moisture. The black graduations are more legible than on the yellow rules, and as our improved white finish rules can be cleaned with water, oil or alcohol, their neat appearance can thus be preserved.

No rivets visible on the surface that disturb the reading of the scale. The ends are provided with brass tips.

										Each.
No. 1745-2.	Pocket Rule,	2	feet,	4	fold,	div.	$\frac{1}{16} \times \frac{1}{16}$	in.,	with springs,	$0 35
1745-3.	"	"	3	"	6	"	"	$\frac{1}{14} \times \frac{1}{16}$	"	"	"	45
1745-4.	"	"	4	"	8	"	"	$\frac{1}{16} \times \frac{1}{14}$	"	"	"	60
1745-5	"	"	5	"	10	"	"	$\frac{1}{16} \times \frac{1}{16}$	"	"	"	70
1745-6.	"	"	6	"	12	"	"	$\frac{1}{16} \times \frac{1}{16}$	"	"	"	85
1745-8.	"	"	8	"	16	"	"	$\frac{1}{16} \times \frac{1}{16}$	"	"	"	1 15
1745-M.	"	"	4	"	8	"	"	$\frac{1}{16} \times$ mm.,		"	"	60
1745T-4.	"	"	4	"	8	"	"	$\frac{1}{16} \times \frac{1}{100}$ ft.,		"	"	60
1745T-6.	"	"	6	"	12	"	"	$\frac{1}{16} \times \frac{1}{100}$	"	"	"	85

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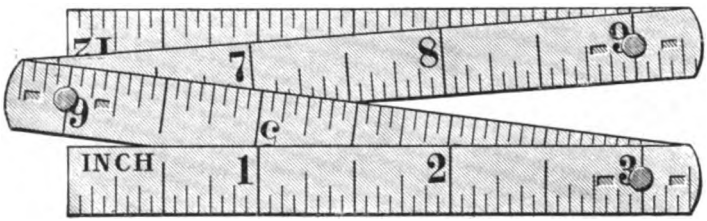
FOLDING STEEL POCKET RULES

SPRING JOINTS

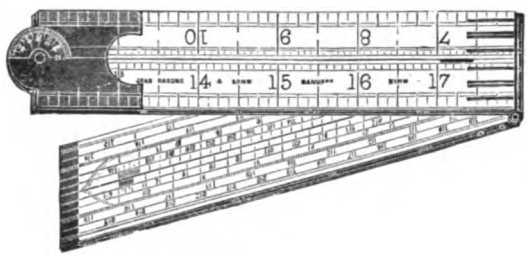


No. 1746-1.

These Rules are accurately graduated on both sides, and the divisions and numbering are clear and distinct. They are made of carefully tempered spring steel, $\frac{3}{8}$ inch wide. When the rule is opened the joints lock firmly, holding the rule in a rigid straight line.

No. 1746-1.	Steel Pocket Rule, 1 foot, 4 fold, div. $\frac{1}{16} \times \frac{1}{16}$ in., Each,	$0	25
1746-2.	" " " 2 " 8 " " $\frac{1}{16} \times \frac{1}{16}$ " "		50
1746-3.	" " " 3 " 12 " " $\frac{1}{16} \times \frac{1}{16}$ " "		75
1746A.	Leather Sheaths for Rules, No. 1746-1, . . . "		10
1746B.	" " " " No. 1746-2, . . . "		12
1746C.	" " " " No. 1746-3, . . . "		15

SCALE RULES



No. 1747.

No. 1747. Ivory Joint Rule, 2 feet, 4 fold; German silver mounted, divided $\frac{1}{8}$, $\frac{1}{10}$, $\frac{1}{12}$, $\frac{1}{16}$ in.; outside edge foot in 100ths. The inside edges are beveled and divided $\frac{1}{16}$, $\frac{1}{8}$, $\frac{3}{16}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$ inches to the foot. The main joint is graduated to 5 degrees, for setting off angles, . . . Each, $7 80

1748. Boxwood Joint Rule, 2 feet, 4 fold; German silver mounted, divided like No. 1747, ... Each, 2 10

1749. Boxwood Joint Rule, 2 feet, 4 fold; Brass mounted, with scales on beveled edges of $\frac{1}{16}$, $\frac{1}{8}$, $\frac{3}{16}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1 inch to the foot. . . . . Each, 1 35

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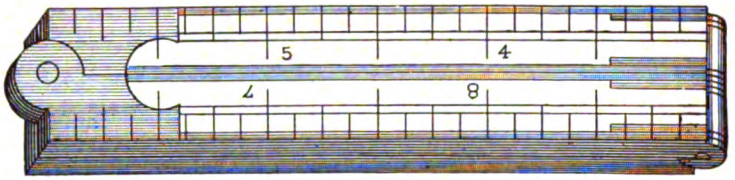
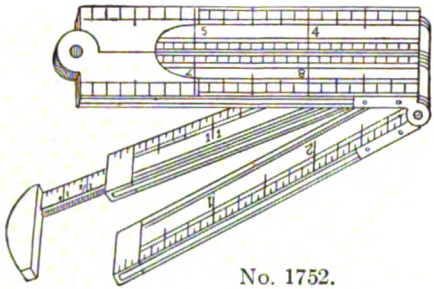
POCKET RULES



No. 1750C.

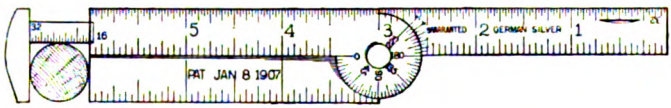
		Each.
No. 1750A.	Pocket Rule, Boxwood, 1 foot, 4 fold, brass mountings, .	$0 12
1750B.	" " " 2 " 4 " " " "	15
1750C.	" " " 1 " 4 " brass-bound edges,	35
1750D.	" " " 2 " 4 " " "	50
1751E.	Pocket Rule, Ivory, 1 foot, 4 fold, German silver mountings,	1 00
1751F.	" " " 2 " 4 " " " "	3 75
1751G.	" " " 1 " 4 " " " bound edges,	2 00
1751H.	" " " 2 " 4 " " " " "	5 00



No. 1752.

No. 1752. Pocket Rule, Boxwood, with Caliper, 1 foot, 4 fold, brass-bound edges, ... Each, $0 60

COMBINATION FOLDING POCKET RULE



No. 1754.

No. 1754. Combination Folding Pocket Rule, German Silver, with Caliper, 6 inch, 2 fold, ... Each, $1 55

This Rule is made of spring German silver, accurately and distinctly graduated; it can be used as a Caliper Gauge, Protractor, Triangle, or Try Square. The upper edge and Caliper arm are graduated in 32ds., and the lower edge in 16ths; the Protractor is graduated to five degrees and the vernier reads to one-half degree. It is adjustable to any angle, and the center joint is so constructed that the rule remains firm wherever set.

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EXTENSION MEASURES

No. 1756C.

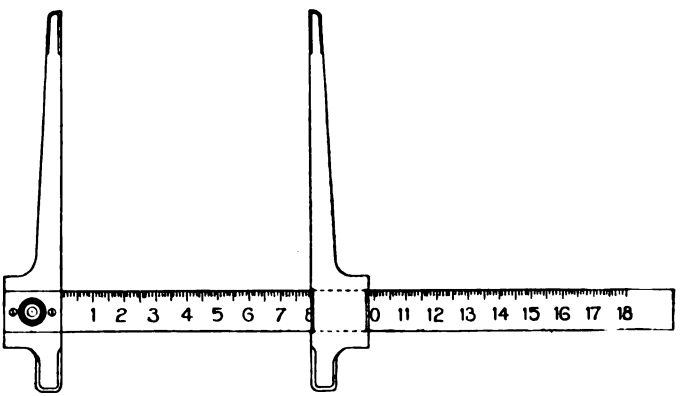
No. 1756A.	Extension Measure,	2	fold,	4	feet,	extending to	8	feet,	Each,	$3 50
1756B.	"	2	"	5	"	"	10	"	"	4 00
1756C.	"	2	"	6	"	"	12	"	"	5 00

No. 1757E.

No. 1757D.	Extension Measure,	3	fold,	3	feet,	extending to	9	feet,	Each,	$5 00
1757E.	"	3	"	4	"	"	12	"	"	6 00
1757F.	"	3	"	5	"	"	15	"	"	7 50

These Measures are of hardwood with brass trimmings, and are graduated to feet, inches and eighths. They are used for measuring floors, walls and windows; also objects which are not accessible for measuring with a tape.

FORESTERS' CALIPERS



No. 1758A.

No. 1758A.	Tree Caliper,	fine	Hardwood,	18	in.,	1	clamp	nut,	Each,	$3 15
1758B.	"	"	"	24	"	2	"	"	"	3 65
1758C.	"	"	"	30	"	2	"	"	"	4 15
1758D.	"	"	"	50	"	2	"	"	"	5 45

These Calipers are of fine seasoned hardwood, best workmanship, both sides of beam graduated to 10ths inches and plainly numbered. The arms are removable for convenience in transportation. The stationary arm is held by brass clamp nuts with lock nut. The eye of sliding arm is brass-lined all around.

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THE SLIDE RULE

The Slide Rule is an instrument for solving all problems involving multiplication and division and powers and roots without the mental effort and waste of time necessary by the usual processes of arithmetic. Some idea of the saving of time effected by the rule may be gained from the fact that $2.13 \times 3.67^2 \div 1.23$ can be solved as quickly as $2 \times 3^2 \div 5$, and either of them much quicker than by the usual process.

The principles to be mastered are few and simple, and a little practice with the rule will convince any one who has much calculating to do, of the folly of doing with the brain what can better and more quickly be done with the rule.

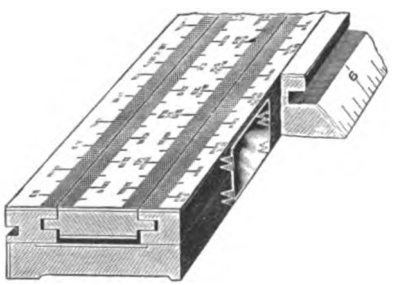
After the elementary rules for operation are acquired, a little practice will make the setting and reading of the rule automatic, as it were, and the rules can be dropped out of mind.

The usefulness of the slide rule is not confined to the work of the engineer, but may be appropriated with equal advantage by the accountant, merchant, importer, manufacturer, auditor, freight agent, passenger agent, and in fact by anyone called upon to perform calculations of any kind.

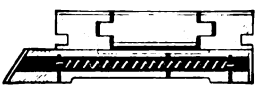
A knowledge of the principles which underlie the workings of the slide rule is not necessary for its successful operation, but an exhaustive, though brief, explanation of the subject will be found in "The Slide Rule," by E. M. Scofield, and in "Mannheim and Multiplex Slide Rules," by L. W. Rosenthal. These books are published by us and will be found listed under Nos. 1775A-1775B.

The Mannheim slide rule was arranged by Lieut. Mannheim, and our improved forms will be found listed on the following pages. As is well known, the ordinary Mannheim slide rule is seldom perfect as regards its mechanical working, and if so, is liable to become warped or shrunken so that the movement of the slide is imperfect. When they get in this condition there is no method of restoring them to perfect working, and they become worthless.

These objectionable features are entirely overcome in our improved Slide Rules. We illustrate below sectional views of these Rules, showing the **"Dietzgen"** and **"Mack"** Improved Automatic Adjustments, which differ from some other so-called "improved" adjustments in that it is not necessary to use a screw-driver each time atmospheric conditions change, as *our improved Slide Rules adjust themselves automatically.* Each construction is manufactured in two styles: with **Mannheim** divisions, and **Multiplex** divisions.



Showing Dietzgen Improved Adjustment.



Showing Mack Improved Adjustment.

Illustrations full size.

For full description of above adjustments, see next page.

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"DIETZGEN" AND "MACK" IMPROVED AUTOMATIC ADJUSTMENTS

Our Slide Rules with *the Dietzgen Improved Automatic Adjustment* consist of a rigid body, or bed of the rule, to which is fastened the grooved guide piece for the slide carrying the scale D, keeping same in an absolutely fixed position. The opposing grooved guide piece is held in place by a number of strong but pliable springs, which are so adjusted as to press the guide piece against the slide. The adjustment forms so close a connection between the edges of the guide strips, on which are scales A and D, and the slide, that the surface of the rule does not show gaps or openings commonly found in other rules and at the same time insures a smooth and easy movement of the slide. The guide strip carrying scale A, by means of the springs will follow every expansion and contraction of the slide, creating a uniform friction between the two guide strips and the slide under *all atmospheric changes.*

The adjustment is *absolutely automatic*, requiring no loosening or tightening of set-screws to adjust.

The Dietzgen Improved Adjustment in no way adds to the size or weight of the rule, and as the springs are well concealed the appearance of the rule is the same as the ordinary slide rule.

Our Slide Rules with *the Mack Improved Automatic Adjustment* are divided longitudinally into two parts, and these parts have a slight parallel motion as regards each other, which is accomplished by means of suitable guide pins, these pins also maintaining the upper and lower scales, or A and D, in perfect register. The two parts of the rule are drawn together by a number of small springs, distributed along the length of the rule, a series of stops limiting the motion of the parts so that when the slide is withdrawn its space in the rule is only about 1-100th of an inch narrower than the slide itself.

As the friction of the slide in the rule is produced by spring pressure, its resistance is uniform throughout its travel, even to the last quarter of an inch, and this feature alone makes it as superior to the ordinary form as our modern pivot joint compass is to the old hinge joint pattern. It has also a marked advantage in that it the parts become warped they may be straightened by scraping, as the spring pressure will compensate any difference in width of the slide, or deviation in the parallelism of its edges.

All the guide pins, springs and stops are concealed within the body of the rule, the only visible difference between this and ordinary slide rules being a fine longitudinal slit, while its advantages in working and durability are manifest.

As will be noted by above description, atmospheric changes which are liable to render the ordinary Mannheim Rule worthless, do not interfere at all with the perfect working of the Mack improved form.

THE MULTIPLEX SLIDE RULE

The "Multiplex" is the most perfect acting and durable of all slide rules and represents the only important advance which has been made in the art since the advent of the Mannheim types. Not only does it broaden the field of application, but it also offers a convenient means of more rapid working, securing greater accuracy at the same time. The theoretical and mechanical principles upon which the Multiplex Slide Rule is based, are identical in all respects to those underlying the action of the ordinary Mannheim rules, so that the operator has but little more to learn, although there is much to be gained.

Not only does the Multiplex solve all arithmetical, trigonometrical and logarithmic examples which are possible with the Mannheim, and in the same convenient and rapid manner, but it further possesses the following characteristic advantages:

1. Multiplication of three numbers in one setting.
2. Division of one number by two numbers in one setting.
3. More convenient solution of inverse proportion.
4. Direct solution in a single setting of a series of divisions with a constant dividend.
5. Direct reading of cubes and cube roots.
6. Direct reading of three-halves and two-thirds powers.
7. Direct solution in a single setting of many combined operations which require the slide to be shifted with the Mannheim rule.

The only change on the face of the rule from the ordinary Mannheim type is the substitution of a reversed or *reciprocal scale* for one of the upper scales on the slide. This scale is of the same length and division as the one replaced. It introduces no complication whatever and does not in any way subtract from the operations possible with the other types of rules.

In addition to the above, the rules are provided with a *cube scale*, which is not located on the face of the rule. Hence this arrangement does not confuse the operator in the solution of ordinary problems, but gives the same clear reading surface that is found on the Mannheim rules. The cube scale makes it possible to obtain direct readings in a single setting of cubes, cube roots, three-halves and two-thirds powers, besides broadening the field of application in a great measure with a corresponding saving in time and an increase of accuracy.

By combining the ordinary scales with the reciprocal and cube scales, as the Multiplex Rule does, ninety-three separate and distinct solutions of practical problems are secured in a single setting against about one-third that number for the Mannheim Rule.

A Manual or Book of Instructions by L. W. Rosenthal accompanies each Multiplex Rule, giving to the beginners the elements of the subject necessary for the proper understanding of the theory and practical application of the Mannheim and Multiplex Slide Rules. In it the attempt was made to include a simple but thorough explanation with examples of every application of the slide rule that is useful to the Engineer or Student. There has also been added to the text a large amount of useful data and conversion tables applicable to slide rules.

For prices of Multiplex Slide Rules, see next page.

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THE MULTIPLEX SLIDE RULE *Continued*

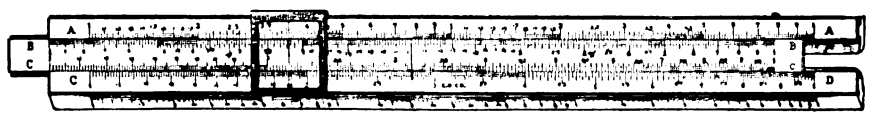
Patented Aug. 9, 1904.

WITH DIETZGEN IMPROVED AUTOMATIC ADJUSTMENT

No. 1760B.

No. 1760A.	Multiplex Slide Rule, with Cube and Reciprocal Scales, 5 in., divisions on white ivorine, glass Indicator and Dietzgen Improved Automatic Adjustment, in case, with Book of Instructions, ... Each,	$ 5 00
1760AL.	Multiplex Slide Rule, like No. 1760A, but 8 in., "	5 00
1760B.	" " " " " " 10 " "	5 00
1760BL.	" " " " " " 16 " "	12 00
1760C.	" " " " " " 20 " "	15 00
1761A.	Multiplex Slide Rule, with Reciprocal Scale but no Cube Scale, 5 in., divisions on white ivorine, glass Indicator and Dietzgen Improved Automatic Adjustment, in case, with Book of Instructions, ... Each,	$ 4 50
1761AL.	Multiplex Slide Rule, like No. 1761A, but 8 in., "	4 50
1761B.	" " " " " " 10 " "	4 50
1761BL.	" " " " " " 16 " "	11 50
1761C.	" " " " " " 20 " "	14 50

WITH MACK IMPROVED AUTOMATIC ADJUSTMENT



No. 1762B.

No. 1762A.	Multiplex Slide Rule, with Cube and Reciprocal Scales, 5 in., divisions on white ivorine, glass Indicator and Mack Improved Automatic Adjustment, in case, with Book of Instructions, ... Each,	$ 5 00
1762AL.	Multiplex Slide Rule, like No. 1762A, but 8 in., "	5 00
1762B.	" " " " " " 10 " "	5 00
1762BL.	" " " " " " 16 " "	12 00
1762C.	" " " " " " 20 " "	15 00
1763A.	Multiplex Slide Rule, with Reciprocal Scale but no Cube Scale, 5 in., divisions on white ivorine, glass Indicator and Mack Improved Automatic Adjustment, in case, with Book of Instructions, ... Each,	$ 4 50
1763AL.	Multiplex Slide Rule, like No. 1763A, but 8 in., "	4 50
1763B.	" " " " " " 10 " "	4 50
1763BL.	" " " " " " 16 " "	11 50
1763C.	" " " " " " 20 " "	14 50

The Multiplex Rule without the Cube Scale is best adapted for those who do not require the solution of the more complex problems involving powers and roots. This Rule will be found to possess many important advantages over the ordinary Mannheim rules, although it is not of such wide application as the Multiplex Rule with the Cube Scale.

For full description of Automatic Adjustments, see pages 214-215.

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THE MACK IMPROVED SLIDE RULE

Patented June 28, 1898.

No. 1765.

No. 1764.	Mack Improved Slide Rule (Mannheim), 5 in., divisions on white ivorine, glass Indicator and Mack Improved Automatic Adjustment, in case, with Directions, Each,	$ 4 50
1764L.	Mack Improved Slide Rule (Mannheim), 8 in., divisions on white ivorine, glass Indicator and Mack Improved Automatic Adjustment, in case, with Directions, Each,	4 50
1765.	Mack Improved Slide Rule (Mannheim), 10 in., divisions on white ivorine, glass Indicator and Mack Improved Automatic Adjustment, in case, with Directions, Each,	4 50
1765L.	Mack Improved Slide Rule (Mannheim), 16 in., divisions on white ivorine, glass Indicator and Mack Improved Automatic Adjustment, in case, with Directions, Each,	10 00
1767.	Mack Improved Slide Rule (Mannheim), 20 in., divisions on white ivorine, glass Indicator and Mack Improved Automatic Adjustment, in case, with Directions, Each,	12 50

THE DIETZGEN IMPROVED SLIDE RULE

No. 1769.

No. 1768.	Dietzgen Improved Slide Rule (Mannheim), 5 in., divisions on white ivorine, glass Indicator and Dietzgen Improved Automatic Adjustment, in case, with Directions, ... Each,	$ 4 50
1768L.	Dietzgen Improved Slide Rule (Mannheim), 8 in., divisions on white ivorine, glass Indicator and Dietzgen Improved Automatic Adjustment, in case, with Directions, Each,	4 50
1769.	Dietzgen Improved Slide Rule (Mannheim) 10 in., divisions on white ivorine, glass Indicator and Dietzgen Improved Automatic Adjustment, in case, with Directions, Each,	4 50
1769L.	Dietzgen Improved Slide Rule (Mannheim) 16 in., divisions on white ivorine, glass Indicator and Dietzgen Improved Automatic Adjustment, in case, with Directions, Each,	10 00
1770.	Dietzgen Improved Slide Rule (Mannheim), 20 in., divisions on white ivorine, glass Indicator and Dietzgen Improved Automatic Adjustment, in case, with Directions, Each,	12 50

A closer reading is obtained on the 16 and 20-inch Rules, as the subdivision of the scales is carried much further, which also greatly facilitates the ready reading of the various scales.

For full description of Automatic Adjustments, see pages 214-215.

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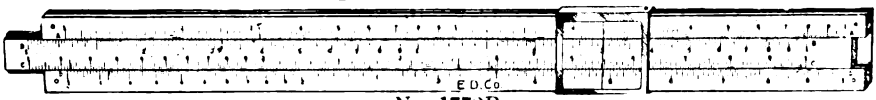
THE ECONOMY SLIDE RULE

No. 1771A.

No. 1771A.	Economy Slide Rule (Mannheim), 10 in., divisions on white ivorine, glass Indicator, in case, with Directions, ... Each,	$3 00
1771B.	Economy Slide Rule (Mannheim), 10 in., divisions on polished hardwood, glass Indicator, in case, with Directions, ... Each,	2 75

The Economy Slide Rules have the same scales as our Nos. 1765 and 1769 Slide Rules, but are without the automatic slide adjustment. They are made of carefully seasoned material, and have the advantage over imported rules in that they are less liable to warp or shrink.

THE UNION SLIDE RULE



No. 1772B.

No. 1772A.	Union Slide Rule (Mannheim), 5 in., divisions on white ivorine, glass Indicator. in case, with Directions, Each,	$3 30
1772B.	Same as No. 1772A, but 10 in. long. . . . . "	3 60

The difficulty experienced with all the regular Slide Rules up to the present time, has been the unsatisfactory working of the slide, which is principally due to the shrinking and warping of the wood to which the divided scales are cemented.

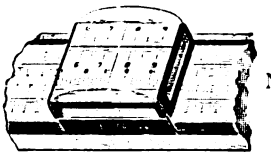
In the Union Slide Rule all these difficulties have been obviated byan ingenious method of attaching the scales A and D to a flexible back, substantially of the same material as the face of slide and scales, thus insuring a uniform expansion and contraction under all conditions of atmospheric changes, thereby maintaining a true and smoothly working slide at all times.

The back of the rule has a scale of decimeters and millimeters on one edge, and inches and sixteenths on the other.

Nearly all visible parts of the rule are of white ivorine, thus showing the graduations in a distinct and legible way and giving the instrument a very neat and attractive appearance.

SUNDRIES FOR SLIDE RULES

No. 1773B.



No. 1773M.

No. 1773A.	Glass Indicator with one hairline (as furnished with Rules), ... Each,	$0 50
1773B.	Glass Indicator with two hairlines, ... "	70
1773M.	Magnifier, mounted on the Indicator, ... Extra	2 50
1774-5.	Sole Leather Case for 5 inch Slide Rules, . . . Each,	60
1774-8.	" " " " 8 " " " . . . "	70
1774-10.	" " " " 10 " " " . . . "	80
1774-16.	" " " " 15 " " " . . . "	1 00
1774-20.	" " " " 20 " " " . . . "	1 25

BOOKS OF INSTRUCTION FOR SLIDE RULES

No. 1775A.	"The Slide Rule" by E. M. Scofield, 24 pages (furnished free with "Mack," "Dietzgen Improved," "Economy" and "Union" Rules), ... Each,	$0 25
1775B.	"Mannheim and Multiplex Slide Rules." Theory and practical application, by L. W. Rosenthal, 59 pages (furnished free with "Multiplex" Rules), ... Each,	50

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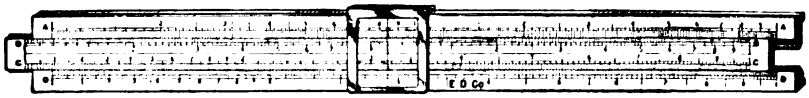
COLLEGE SLIDE RULE

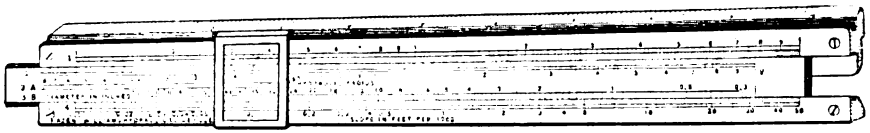


No. 1778.

No. 1778. College Slide Rule (Mannheim), 10 in., Hardwood, divisions on white paper, with transparent ambro Indicator and Directions, ... Each, $1 00

The College Slide Rule is graduated with Mannheim divisions on a white coated paper. It is well made, and intended for the use of students, enabling them, at a slight expense, to become familiar with the use of the Slide Rule.

HAZEN-WILLIAMS HYDRAULIC SLIDE RULE



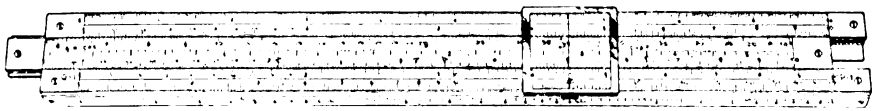
No. 1778A.

No. 1778A. Hazen-Williams Hydraulic Slide Rule, 10 in., divisions on white ivorine, glass Indicator, in case, with Directions, ... Each, $6 00

The Hazen-Williams Hydraulic Slide Rule is used principally for determining the velocity and quantity of the flow of water in pipes and channels, but is also adapted for ordinary slide rule calculations. Special computations, such as the following, may also be solved by its use: to determine the corresponding flow at any other slope or head, when the flow of water through a pipe or system of pipes produced by a given slope or head is known; to find what size of pipe must be used to produce the same discharge for any other slope, when the discharge in a given size of pipe at a given slope is known; to compute the discharge through a compound pipe, that is, a pipe of larger diameter connecting with a pipe of smaller diameter, or a series of such pipes; to compute the friction of a given amount of water flowing through two pipes of different diameters and different lengths, freely connected at each end; to get with one setting of the slide the quantity of water corresponding to any slope; to get with one setting of the slide the quantities of water discharged by pipes of different sizes for a given slope and coefficient.

In size and general appearance the rule is like an ordinary Mannheim 10-inch slide rule. On the back of the rule are several tables to aid in the convenience of computations to which the rule is applicable.

UNIVERSAL SLIDE RULE



No. 1778B.

No. 1778B. Universal Slide Rule, 10 in., divisions on white ivorine, glass Indicator, in case, with Directions, . . . Each, $6 00

The Universal Slide Rule possesses, in addition to the scales of the ordinary slide rule, a scale for the direct determination of cube roots and a scale of squares 1 to 100.

The center scale on the slide gives the values of sin n cos n; this scale is continued along the upper edge of the slide up to the graduation 45. The remainder of this line is a scale 0 to 45, running from right to left and giving the value of $\cos^2 n$. By the use of these scales the horizontal distance between the observer's station and any point, and the difference in height of these two points are readily obtained, making the rule of great value for the calculation of stadia determinations.

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A. W. FABER'S SLIDE RULES

No. 1779. Faber's Slide Rule, 5 in., white celluloid surface, glass Indicator, with directions, ... Each, $3 25

1780. Faber's Slide Rule, 10 in., white celluloid surface, glass Indicator, with directions, ... Each, 4 25

1781. Faber's Slide Rule, 10 in., with self-adjusting slide, white celluloid surface, glass Indicator, with directions, . Each, 4 75

1782 Faber's Slide Rule, 10 in., like No. 1781, but without lateral lines, with directions, ... Each 4 75

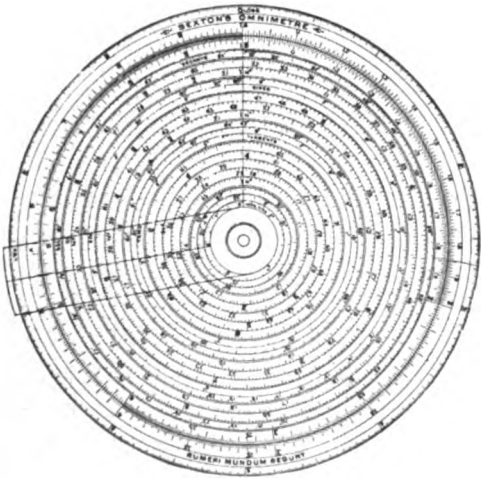
1783. Faber's Slide Rule, 10 in., with self-adjusting slide and Digit Indicator, white celluloid surface, with directions, . Each 5 00

1783A. Faber's Slide Rule, 10 in., for Electrical and Mechanical Engineers' use; with Log-Log Scales, slide spring and special Indicator, white celluloid surface, with directions, . Each, 5 75

1784. Faber's Slide Rule, 20 in., with self-adjusting slide and Digit Indicator, white celluloid surface, with directions, . Each, 16 25

SEXTON'S OMNIMETRE

Functions: Logarithms, Numbers, Squares, Square Roots, Cubes, Cube Roots, Sines, Tangents, Versed Sines, Secants.



No. 1786C

No. 1786A. Sexton's Omnimetre No. 1, diam., 7¼ inches, Bristol Board Discs, Readings from edge of runner. . . . . Each, $1 00

No. 1786B. Sexton's Omnimetre No. 2, diam., 7¼ inches, Non-absorbent Card Discs, Readings from hair-lined runner. Lower disc perforated to facilitate manipulation, . . . Each, $2 00

No. 1786C. Sexton's Omnimetre No. 3, diam., 7 inches, Non-absorbent Bristol Board Discs, Readings from hair-lined runner. Lower disc perforated to facilitate manipulation. Milled nut to clamp discs in position when required. Character of graduations gives increased ease of reading. Additional functions, fifth powers and fifth roots, ... Each, $3 00

No. 1786D. Companion Instrument, No. 6, diam., 6⅛ inches. This instrument consists of a card board disc, a transparent disc, and a transparent runner. Printed upon the card board disc is a logarithmic scale about 13½ feet long, arranged in circles. The instrument is intended as a companion to the Omnimetre (although it will answer as a companion to the straight slide rule as well) for those who wish to read accurately, at least four figures in the answers to problems of multiplication and division, Each, $2 00

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THE ENGINEERS' SLIDE RULE

Patented July 2, 1901.

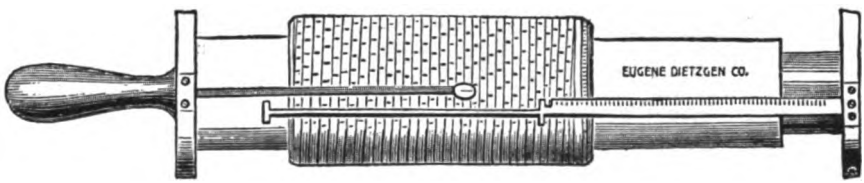
No. 1787.

No. 1787. The Engineers' Slide Rule, 24 in., Hardwood, with directions,
Each, **$5 00**

This is an improved slide rule, arranged by Edwin Thacher and E. M. Scofield, Bridge Engineers, in order to combine a maximum of speed with a maximum of accuracy. It is 24 inches long and comprises two complete rules upon one stick.

It multiplies three numbers at one setting, gives powers and roots and has an accuracy equal to a 48 inch rule for ordinary work. No runner is required. Directions for using same are engraved on each rule.

FULLER'S SLIDE RULE



No. 1794.

No. 1794. Fuller's Spiral Slide Rule, in mahogany box, with directions,
Each, **$30 00**

This form of calculating machine, which is the simplest yet made, facilitates very greatly the numerous arithmetical calculations required in the office of the Engineer, Architect and Actuary.

Its range is greater than that of most arithmetical machines, as, besides the operations of multiplication and division which many instruments can only perform, results requiring the reciprocals, powers, roots, or logarithms of numbers, can be quickly and easily obtained by its use.

The rule consists of a cylinder that can be moved up and down upon, and turned round, an axis, the latter being held by a handle. Upon this cylinder is wound in a spiral a single logarithmic scale. Fixed to the handle is an index. Two other indices, whose distance apart is the axial length of the complete spiral, are fixed to an inner cylinder. This inner cylinder slides inside the axis like a telescope tube, and thus enables the operator to place these indices in any required position relative to the logarithmic scale. Two stops are so fixed that when they are brought in contact the index points to the commencement of the scale.

The use of slide rules has been confined to roughly approximate calculations, as the length of scale hitherto made was sufficient only for about 160 divisions. In the new rule the length of scale is 500 inches and the number of divisions 7,250, consequently the approximation obtained by its use is sufficient for most of the calculations required by Engineers and Architects, and for many of those required by Actuaries.

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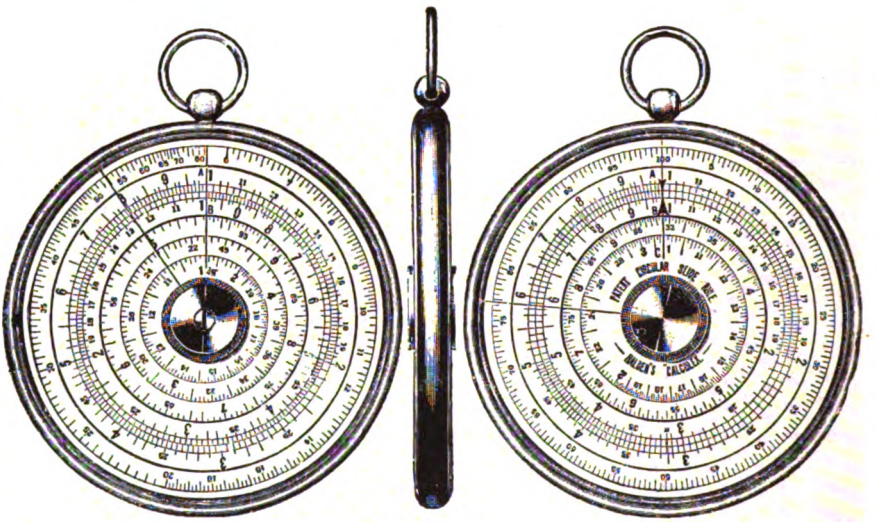
THE IMPROVED HALDEN CALCULEX



Back Face No. 1795A. Front Face

No. 1795A. Improved Halden Calculex, watch pattern, diam. 2⅜ in., in leather case, with Book of Rules, ... Each, $6 25

The Improved Halden Calculex is the most practical and durable circular slide rule manufactured. It consists of a metal disc, graduated and glass-covered on both sides. The central section of the disc and the glass covers (marked with hairlines) are revolvable.

There are eleven scales on the two faces of the instrument. The front face (see cut) has five circles of scales: The outer one, or No. 1, is a scale of logarithms; Nos. 2 and 3 are the calculating scales A and B; Nos. 4 and 5 are the square roots of scale B. The back face (see cut) shows six circles of scales: The outer one, or No. 6, is a scale of angles; Nos. 7 and 8 are calculating scales for inverse proportions; Nos. 9, 10 and 11 are cube roots of scale B.

The log. of a number, squares, square roots, cubes, cube roots, angles, etc., can be found by reading direct from the hairlines without moving the dial. By means of the reciprocal scale, such calculations as 3.15×5.85×4.25 may be solved **in one setting**.

As the graduated disc of the Calculex is made of metal, it cannot warp or shrink; consequently, the scales will retain their accuracy. The simple construction makes the instrument easy to operate; and, as there are no knobs, keys, or gears used, it cannot get out of order.

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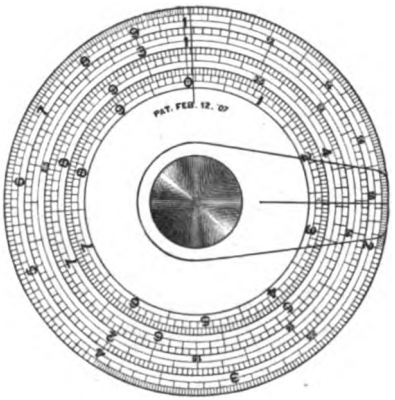
THE ROTO RULE



No. 1795B.

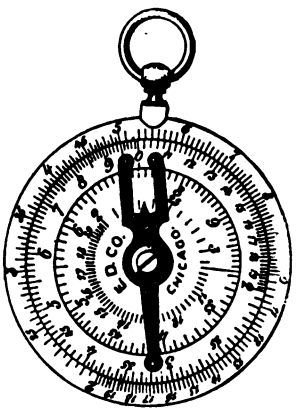
The Roto Rule is a circular slide rule, $3\frac{5}{16}$ in. diameter, made of heavy white celluloid. It consists of four concentric scales and two radial indices. The numbers on the second and third scales are the square roots of the numbers on the first or outside scale, and the numbers on the fourth scale are the logarithms of the numbers on the first scale. The ruling is clear and distinct, and as the divisions are of the same size as on a straight 10 in. rule, it can be easily and quickly read. The range is practically unlimited, as the scales are endless. The rule is well made, durable, and convenient to carry, weighing but one ounce.

No. 1795B. Roto Rule, in neat leather case, with directions, Each, **$2 50**

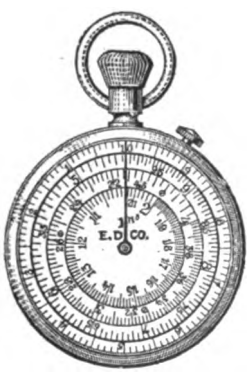
CHARPENTIER CALCULATOR

The Charpentier Calculator is a circular slide rule, $2\frac{3}{4}$ in. diameter, with a circular slide which is revolved and set by the handle. This instrument reads scale against scale like the ordinary slide rule, and being made of metal, is but slightly affected by atmospheric variations. Square roots, sines, and tangents, as well as logarithms, may be found with it, and as the circular scale is equivalent to a straight one $5\frac{1}{4}$ in. long, results may be read off with a fair degree of accuracy. The small dimensions and light weight of the instrument make it very suitable for pocket use.

No. 1796. Charpentier Calculator, Each, **$5 00**



No. 1796.



No. 1797.

BOUCHER CALCULATOR

The Boucher Calculator is made similar to an ordinary stem-winding watch, with glass covered dials back and front. Ratios are set off by means of pointers which, as well as the movable dial, are turned by means of the "stem-winder" key. It is $2\frac{1}{16}$ inches in diameter by $\frac{5}{16}$ inch thick, and does not take up more room in the pocket than an ordinary watch.

No. 1797. Boucher Calculator, enameled cardboard dials, ... Each, **$8 50**

1797½. Boucher Calculator, silvered metal dials, ... Each, **14 00**

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BUNZEL RECKONING MACHINES

No. 1798B.

This Reckoning Machine is of simple, reliable and durable construction, and will retain its efficiency and accuracy indefinitely. Any calculations embracing Addition, Subtraction, Multiplication, Division, Powers or Roots can be performed by its aid in a very small fraction of the time required by any other method, and the results are **absolutely correct.** The tedious and tiresome part of mathematical computations is entirely removed, and the user can compute the most difficult problems steadily for weeks without fatigue.

The computations are performed by setting the shifters in the grooves and then turning the handle. The machine will multiply two factors, each of which may have as many figures as there are grooves. The labor involved in computing any mathematical problem within the scope of the machine is reduced to a minimum. A large number of these machines are now being used in this country and in Europe and they are giving general satisfaction. Each machine is guaranteed to be free from defects in workmanship and material.

No. 1798A.	Reckoning Machine, 6 grooves, 12 holes in upper row, ...	Each,	**$225 00**
1798B.	Reckoning Machine, 8 grooves, 16 holes in upper row, ...	Each,	**276 00**
1798C.	Reckoning Machine, 10 grooves, 20 holes in upper row, ...	Each,	**345 00**

Complete instructions furnished with each machine.

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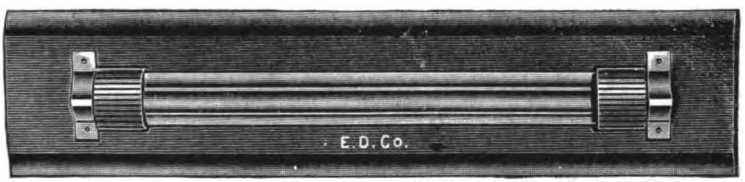
PARALLEL RULES

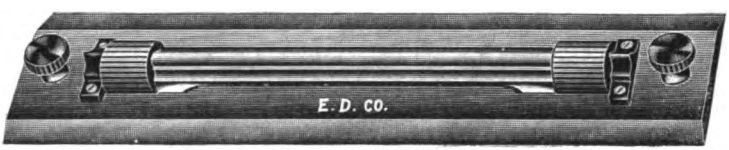
Nos. 1800–1811.

		Best quality.
No. 1800.	Ebony Parallel Rules, brass bars, 6 in., ...	Each, $0 30
1801.	" " " " " 9 "	" 60
1802.	" " " " " 12 "	" 75
1803.	" " " " " 15 "	" 90
1804.	" " " " " 18 "	" 1 20
1805.	" " " " " 24 "	" 2 10
1806.	Rubber Parallel Rules, nickel-plated bars, 6 in., .	" 75
1807.	" " " " " 9 " .	" 90
1808.	" " " " " 12 " .	" 1 20
1809.	" " " " " 15 " .	" 1 50
1810.	" " " " " 18 " .	" 1 80
1811.	" " " " " 24 " .	" 2 40



Nos. 1820–1823.

No. 1820.	Ebony Rolling Parallel Rules, brass mountings, 9 in.,	Each, $2 70
1821.	" " " " " " 12 "	" 3 30
1822.	" " " " " " 15 "	" 3 90
1823.	" " " " " " 18 "	" 4 80



Nos. 1841–1855.

No. 1841.	Solid Brass, fine finish, Rolling Parallel Rule, 9 in.,	Each, $ 7 25
1842.	" " " " " " " 12 "	" 8 50
1843.	" " " " " " " 15 "	" 10 00
1844.	" " " " " " " 18 "	" 12 00
1845.	" " " " " " " 24 "	" 18 00
1851.	Solid German Silver Rolling Parallel Rule, 9 in.,	" 8 50
1852.	" " " " " " 12 "	" 10 00
1853.	" " " " " " 15 "	" 12 00
1854.	" " " " " " 18 "	" 15 00
1855.	" " " " " " 24 "	" 20 00

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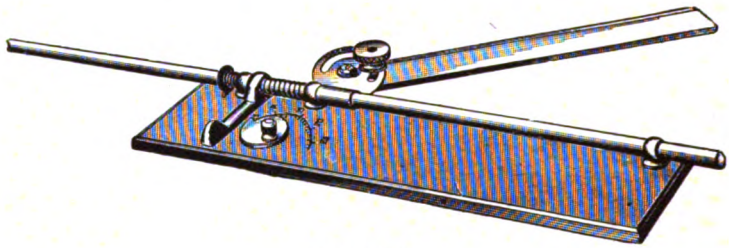
SECTION LINERS

THE PRACTICAL SECTION LINER



No. 1864.

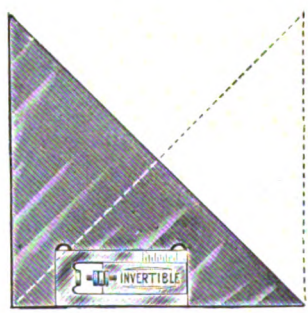
No. 1864. Practical Section Liner, of Hardwood, with nickel-plated mountings, blade 8 inches long, in case, ... Each, **$1 50**

1864½. Practical Section Liner, like No. 1864, but with Transparent Ambro blade, one edge beveled, in case, ... Each, **1 85**

Strong, simple and durable. Great range of work, permits spacing from 1-1000 to ½ inch, at any angle, without changing position.

Retains its place on the board by means of pins in the bottom of base, and without the aid of T-square, straight-edge, hands or weights.

INVERTIBLE SECTION LINER



No. 1865.

No. 1865. Invertible Section Liner, ... Each, **$1 90**

An inexpensive, simple, durable, accurate Section Liner for use with straight edge. Made of transparent celluloid, with perfect edges. Automatic Spacer is of metal, held in position by tongue and groove; invertible, allowing double use of hypotenuse and perpendicular of triangle. Simple to operate and adjust, with wide range of work.

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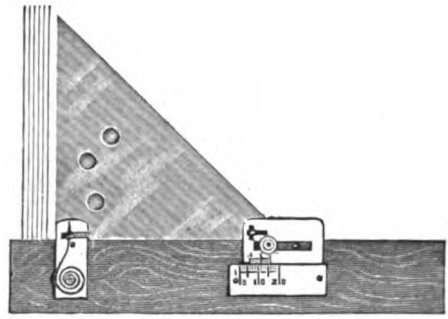
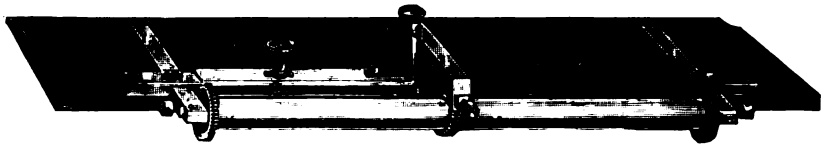
PATENT SECTION LINER



No. 1865½.

No. 1865½. Patent Section Liner, triangle of transparent ambro, straight edge of hardwood, German silver mountings; a very reliable and simple instrument, which requires hardly any practice to manipulate it. By the scale and vernier the smallest distances can be regulated, ... Each, **$3 50**

STERLING SECTION LINER



No. 1865.

No. 1866. Sterling Section Liner, 10 in., of German silver, with ebony straight edge, in case, ... Each, **$7 00**

1867. Sterling Section Liner, 10 in., like No. 1866, but with German silver straight edge and scale on rack for regulating space between lines, in case, ... Each, **8 50**

This instrument is operated with one finger of the left hand by pressing upon set screw on top of the movable lever and not releasing same until line is drawn. The distance between the lines is determined by the adjusting screw in center of spring lever. The instrument is absolutely accurate and easily operated, no practice being required.

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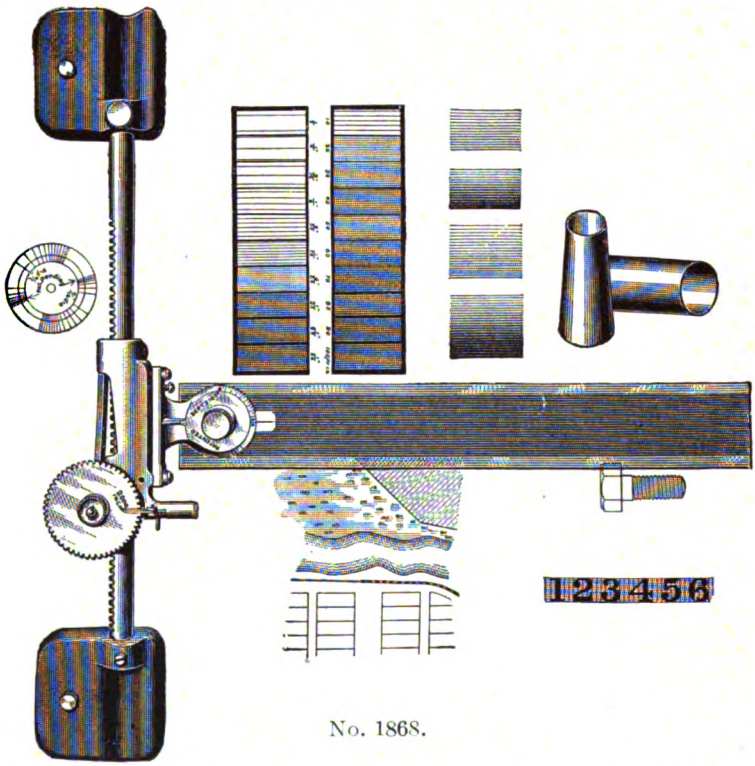
SECTION LINERS *Continued*

POSITIVE SECTION LINER



No. 1868.

No. 1868. Positive Section Liner, transparent ambro lined blade 12 in. long, with full directions for using, Each, $6 50
1869. Positive Section Liner, like No. 1868, blade 14 inches long, " 7 50

The construction of the Positive Section Liner is as follows: a round metal bar, 14 in. long, on which is an accurately cut rack 10½ in. in length; to this bar is attached a perfectly fitting carriage, bearing the ruling blade and advancing mechanism, and at each end is an adjustable weight, provided with a needle-pointed movable stop to prevent the instrument from slipping. The width of lines is regulated by notched wheels, placed on the pinion shaft of the advancing mechanism; a wheel for decimal and one for fractional parts of an inch are furnished, and also various card dials for shading cylindrical or curved surfaces.

The exceptional range of this instrument for all section lining and shading work makes it of great practical value. It is very accurate, durable, and simple to operate and adjust.

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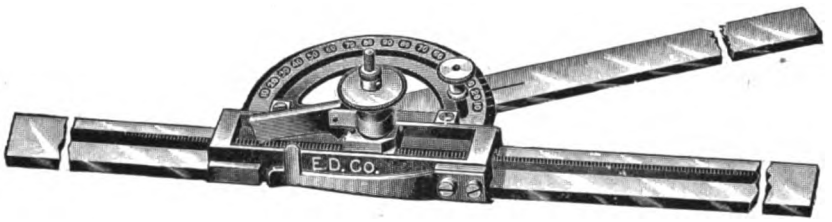
SECTION LINER AND SCALE DIVIDER



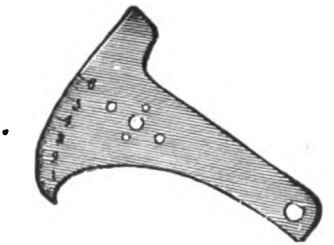
No. 1874A.

No. 1874A. Section Liner and Scale Divider, German Silver, base 14½ in., rack 9 in., with arm projecting 10 inches beyond protractor. The protractor is graduated to degrees. In wooden case, with full instructions for use,. . Each, **$12 00**

1874B. Section Liner and Scale Divider, like above, but protractor with vernier reading to five minutes, . . . Each, **13 00**

This Section Liner is of simple, but substantial construction, of finest workmanship, absolutely accurate, and is easily and rapidly operated. With this instrument from 4 to 200 parallel lines per inch can be drawn, and when properly set, inch scales from ⅛ to 3 inches to the foot, decimal scales up to 1000 per foot, etc., can be rapidly and accurately produced by it.

ODONTOGRAPH



No. 1875.

No. 1875. Templet Odontograph, for describing Teeth of Gear Wheels. A useful instrument for mechanical drawing, with full description, in case, ... Each, **$3 50**

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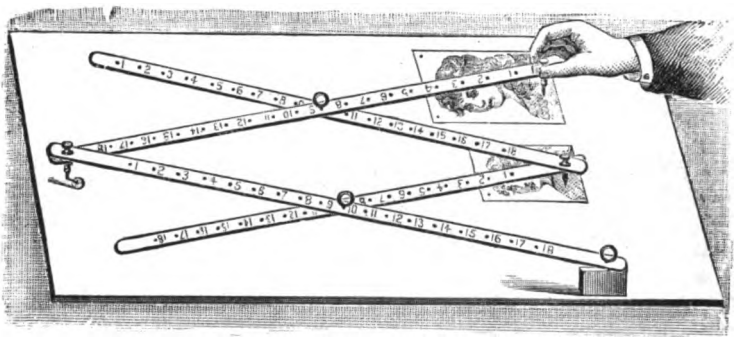
PANTOGRAPHS

For Enlarging and Reducing Drawings.



No. 1876.

No. 1875½. Pantograph of polished wooden bars, 41 in. long, fancy lined, with joints formed by bolts and thumb nuts, metal foot. For reducing and enlarging drawings in 34 ratios, from 8:1 to 1½:1 or vice versa. In plain wooden box, ... Each, **$5 00**

1876. Heavily mounted, with nickel-plated elbow joint wheel, pencil holder and exchangeable point; finely polished, black figures, in neat box, 21 inches long, ... Each, **2 50**

1877. Brass mounted, with brass elbow joint wheel, pencil holder and movable point; polished, black figures, in box, . Each, **2 00**

1878. Brass mounted, same as No. 1877, in every respect, except that it is not polished, in box, ... Each, **1 50**

1879. Brass mounted, same as No. 1878, except movable point instead of wheel, ... Each, **1 00**

1880. The best Pantograph for the price. It has very neat and substantial trimmings, clean cut figures; a very neat and satisfactory instrument, ... Each, **50**

1881. Is a smaller instrument. It is recommended by teachers as an excellent means of familiarizing children with form and proportion, and greatly assisting them in acquiring a knowledge of the rudiments of drawing by sight from original objects, ... Each, **25**

Complete directions furnished with each Pantograph.

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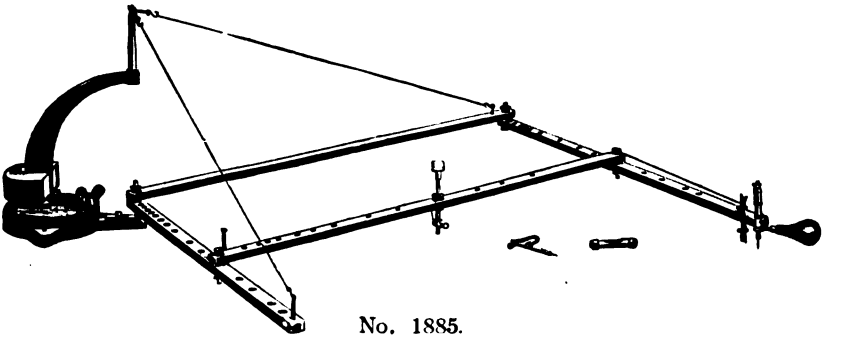
SUSPENDED PANTOGRAPHS

WITH WOODEN BARS



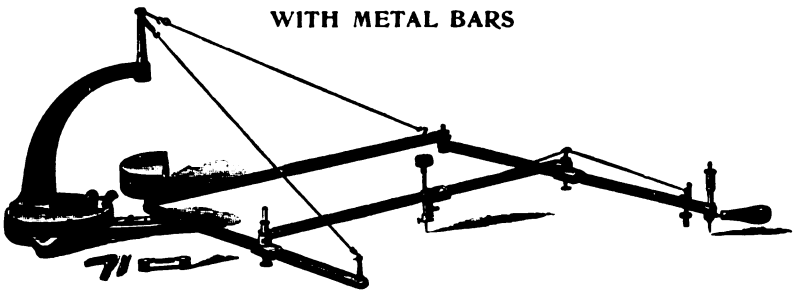
No. 1885.

For Reducing and Enlarging in the following ratios:
5:4, 4:3, 3:2, 5:3, 2:1, 5:2, 3:1, 4:1, 5:1, 6:1, 8:1, 10:1, 12:1, 20:1, or vice versa.

Suspended Pantograph, made of well seasoned Pearwood Bars, connected by polished steel cone joints with holes accurately drilled for the above ratios. Solid iron standard, with weight. Tracing and Pencil point are interchangeable. Instrument complete with adjustable tracing point, steel point, pencil point with 3 brass weights, spirit level and instructions for use. In wooden case with lock and key

No. 1885.	Suspended Pantograph with wooden bars 28 in. long, Each,	$35 00
1886.	" " " " " 33 " " "	36 00
1887.	" " " " " 38 " " "	37 50

WITH METAL BARS



No. 1889.

For Reducing from 20:1 to 5:4 or Enlarging from 1:20 to 4:5 in all ratios.

Suspended Pantograph, made of square hollow metal bars, fully divided and connected by cone joints, insuring an accurate and easy movement. The edges of the tubular slides are beveled to facilitate the reading of ratios. Solid iron standard with 1 extra weight. Tracing and pencil point are interchangeable. Instrument complete with adjustable tracing point, 2 steel points, pencil point with 3 brass weights, spirit level and instructions for use. In wooden case with lock and key.

No. 1889.	Suspended Pantograph with metal bars 28 in. long, Each,	$75 00
1890.	" " " " " 33 " " "	85 00
1891.	" " " " " 38 " " "	92 50

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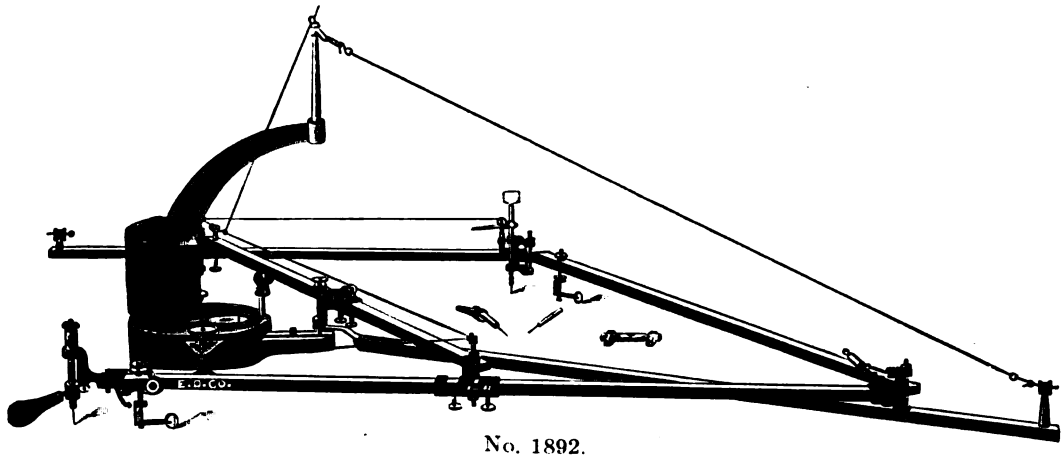
SUSPENDED PANTOGRAPHS

Continued

OF FINE MECHANICAL CONSTRUCTION, ESPECIALLY ADAPTED FOR VERY ACCURATE REPRODUCTIONS.



No. 1892.

For Reducing from 20:1 to 1:1 or Enlarging from 1:1 to 1:20 in all ratios, or reproducing the original size.

Suspended Precision Pantograph, made of square hollow metal bars, connected by pivot joints. The bars are fully divided, with verniers on the tubular slides and micrometer movement for adjusting the proportions. Supporting bar and appliances for interchanging the pole with the pencil point to reproduce the original size. Convenient controlling arrangement for operating the pencil from the tracing point. Solid iron standard, with 2 extra weights, 2 leveling screws, and 2 spirit levels to adjust the instrument to a horizontal position. Instrument complete with adjustable tracing point, 2 steel points, pencil point with 3 brass weights, spirit level and instructions for use.

In polished wooden case with lock and key.

No. 1892.	Suspended Precision Pantograph, with metal bars 33 inches long, ...	Each,	$160 00
1893.	" " " " " " 38 " "	"	170 00
1893½.	" " " like No. 1893, but with reading glass, . .	"	182 00

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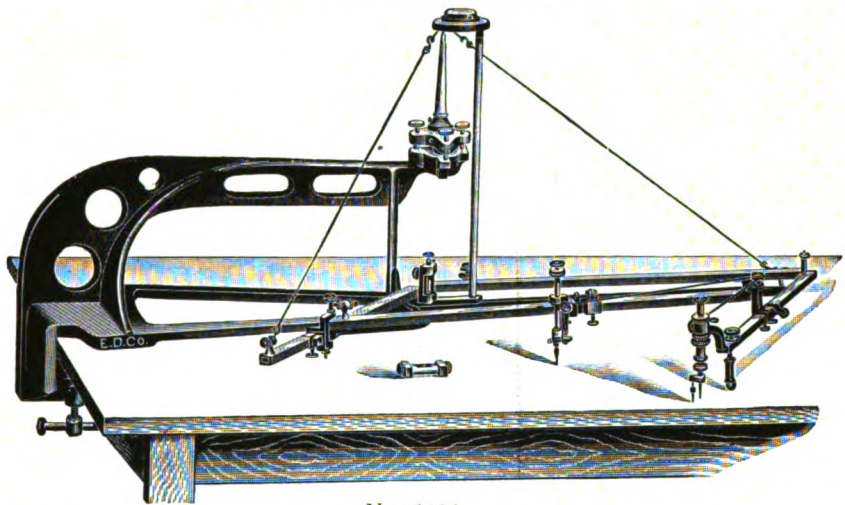
SUSPENDED PANTOGRAPHS · *Continued*

OF FINE MECHANICAL CONSTRUCTION WITH ADJUSTABLE CLAMPING STANDARD, ESPECIALLY ADAPTED FOR VERY ACCURATE REPRODUCTIONS.



No. 1894.

For Reducing from 20:1 to 1:1 or Enlarging from 1:1 to 1:20 in all ratios, or reproducing the original size.

Suspended Precision Pantograph, made of square hollow metal bars, connected by pivot joints. The bars are fully divided, with verniers on the tubular slides and micrometer movement for adjusting the proportions. Supporting bar and appliances for interchanging the pole with the pencil point to reproduce the original size. Convenient controlling arrangement for operating the pencil from the tracing point.

The extra large adjustable clamping standard is of substantial iron construction, of perfect rigidity and firmness, held in position by a clamp screw. The instrument is clamped to the board or table, doing away with weights, and there are no leveling screws in the base to injure the board or drawing. The standard is made of one piece and does not obstruct any part of the drawing, as the base is raised off the board to permit drawings to be passed under it. The vertical support of the standard is readily adjusted by the four leveling screws and the adjustment controlled by means of a sensitive cross level. When the standard is leveled, the cross level with its support is removed and the Pantograph will hold its adjustment.

Instrument complete with adjustable tracing point, 2 steel points, pencil point with 3 brass weights, spirit level and instructions for use. In polished wooden case with lock and key. Standard in separate box.

No. 1894. Suspended Precision Pantograph, with metal bars 24 inches long, ... Each, **$180 00**

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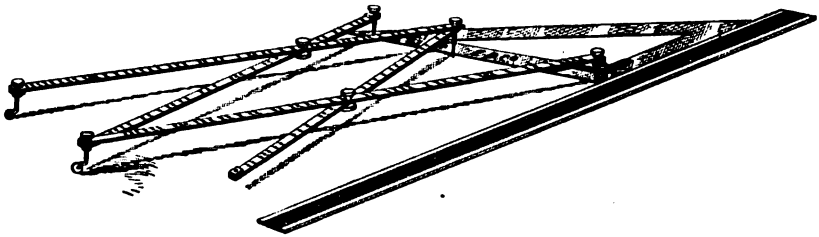
THE BOSTON UNIVERSAL PANTOGRAPH



No. 1898.

No. 1898. Boston Universal Pantograph, of German silver, with 18 in. Transparent Ambro Triangle, in box, with directions, Each, **$45 00**

The Boston Universal Pantograph has been designed in order to combine, at a reasonable cost, the accuracy of very expensive and intricate instruments with the simplicity and handiness of cheap ones. The expectations have been more than fulfilled, inasmuch as the Boston Universal, besides combining the good qualities of former constructions, possesses some new ones of its own, and furthermore, in reducing and enlarging, covers a field never before attempted.

It is of the most simple construction, made of German silver throughout, with the minutest care, and in principle somewhat similar to the ordinary wooden pantograph, and requires, therefore, only a moment to be set to the desired proportion, ready for use.

The pivotal point is mounted on a celluloid triangle which may be placed anywhere on the most delicate drawing without injuring it, and a few weights will secure its position as well as will the commonly used screws or claws.

The center of the pivot is placed exactly over the right-angled corner of the triangle and can, therefore, easily be marked on the plan, making it possible—

1st. To remove the Pantograph entirely and replace it as often as desired.

2d. To change the position of the triangle and still keep the same pivotal point, thus gaining access to that part of the drawing which the triangle may have covered at first, and obtaining a copy of the entire drawing within the sweep of the Pantograph (a circle 8 feet in diameter) without leaving any "bald spots" to be covered separately.

3d. To move the pivotal point from place to place on the plan in the systematic manner and thus reduce or enlarge plans of unlimited size and still get the copy in one piece.

In addition to its use for plain reducing and enlarging, the Boston Universal Pantograph covers a new field in being able to give a copy of a drawing distorted in a systematic manner, making the Pantograph adapted to a variety of purposes more readily imagined than enumerated. These results are obtained by sliding the triangle on which the pivot is mounted along a straight edge, keeping one side of the triangle against the tracer and consequently against the pencil. In this way the scale parallel to the straight edge is retained and the scale at right angles (or 45 degrees) thereto is changed. An easily acquired familiarity with the Pantograph will suggest a wide range of possibilities.

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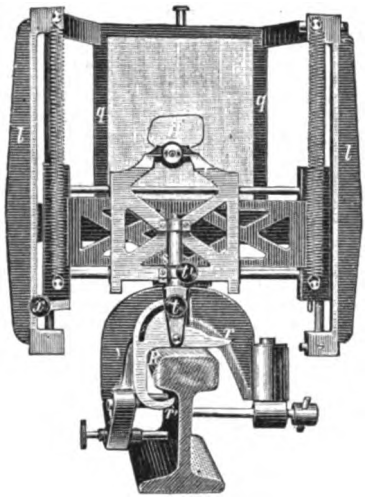
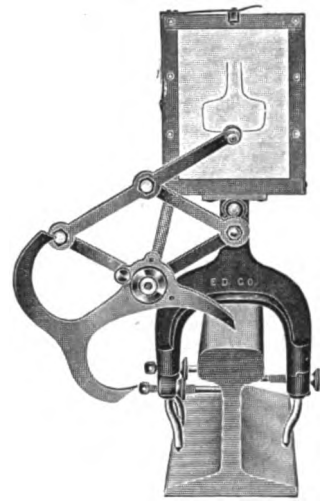
RAIL PROFILE MACHINES



No. 1899.

No. 1899. Schilling's Rail Profile Machine, for producing a true and distinct outline of the head and the upper part of the web of the rail, corresponding to its actual condition on the track, packed in strong wooden box, with Directions, . . Each, **$175 00**

No. 1899A. Milburn's Railograph (Patented March 22, 1910), for the graphic reproduction of the contours of the head and the upper part of the web of the rail, packed in strong wooden box, with Directions, . Each, **$150 00**



No. 1899A.

Of recent years many railroads have been carefully observing and testing the amount and character of wear of their line rails, made under different specifications, with the view of determining the quality and serviceableness of the various rails. To aid in the obtaining of accurate records the Schilling Rail Profile Machine and the Milburn Railograph have been designed. By their use reproductions on paper of the rail or sections of the rail are made in natural size, true to actual conditions, so that comparisons with the original contours can be made. No distrubance of the rail or ties is necessary; either machine is quickly attached or detached by a special clamping arrangement.

Both machines are strongly made, accurate and nicely finished. The frame of the Milburn Railograph is made of aluminum, and the design is such that strength and lightness are combined. It is especially serviceable where a light machine for tracing the upper part of the rail is desired.

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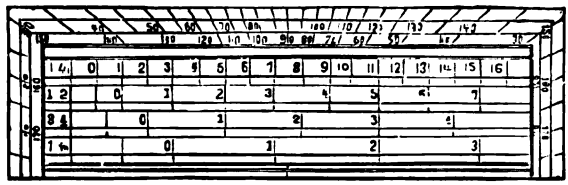
BOXWOOD AND IVORY PROTRACTORS



No. 1903.

No. 1903. Boxwood Protractor, 6 in. long, 1¾ in. wide, scales of ¼, ½, ¾, 1 in. to the foot. Scale of chords; diagonal scales, . . Each, $0 35

1904. Square Ivory Protractor, 6 in. long, 1¾ in. wide, divided: whole degrees, ¼, ½, ¾, 1 in. scales, scale of chords, diagonal scale, scales of 25, 30, 35, 40, 45 parts per inch, . . . Each, 1 60

1905. Square Ivory Protractor, 6 in. long, 1¾ in. wide, divided: whole degrees, ¼, ½, ⅜, ½, ⅝, ¾, ⅞, 1 in. scales, scale of chords, diagonal scale, scales of 30, 35, 40, 45, 50, 60 parts per inch, ... Each, 2 00

1906. Square Ivory Protractor, 6 in. long, 2 in. wide, divided: whole degrees, ¼, ½, ¾, ½, ⅝, ¾, ⅞, 1, 1⅛, 1¼, 1½, in. scales, scale of chords, diagonal scale, scales of 30, 35, 40, 45, 50, 60 parts per inch, ... Each, 4 35

PAPER PROTRACTORS

No. 1909.	Circular Protractor,	on	Drawing Paper,	8	in.	diam.,	½°,	Each, $0 20
1910.	"	"	"	14	"	"	½°,	" 30
1911.	"	"	Bristol Board,	8	"	"	½°,	" 20
1912.	"	"	"	14	"	"	½°,	" 40
1913.	"	"	Tracing Paper,	8	"	"	½°,	" 20
1914.	"	"	"	14	"	"	½°,	" 30

HORN PROTRACTORS

No. 1920.	Semicircular Horn Protractor,	4½	in.	diameter,	1°,	Each,	$0 16
1921.	"	5¼	"	"	½°,	"	28
1922.	"	6¼	"	"	½°,	"	33
1923.	"	7	"	"	½°,	"	45
1924.	"	8	"	"	½°,	"	65

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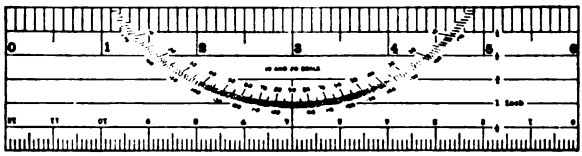
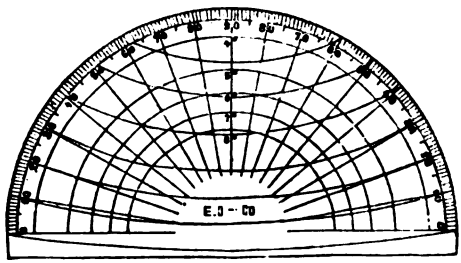
TRANSPARENT AMBRO PROTRACTORS



No. 1925A.

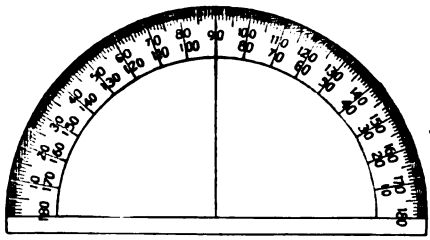
No. 1925A. Ambro Parallel Ruler and Scale Protractor, 10×20 scales, Each, $0 25
1925B. " " " " " " 30×40 " " 25
1925C. " " " " " " Inch and Tenth scales, " 25
1925D. Ambro Parallel Ruler and Scale Protractor, Inch and Metric scales, " 25
1925E. Ambro Parallel Ruler and Scale Protractor, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 inch scales, " 25

Made of flexible transparent ambro, 6 inches in length; combines scale and protractor advantages; lines can be drawn at any desired angle with or parallel to each other without measuring. An inexpensive and useful protractor for Architects, Engineers and Surveyors; excellent for recording notes in field, transit or level books when making surveys.



No. 1926.

No. 1926. Railroad Curve Protractor, Transparent Ambro, 8 in., $\frac{1}{2}°$, with circular curves, from $\frac{1}{2}°$ to 8°, scale 400 feet to the inch, Each, ... $1 65



No. 1928A.

No. 1928A. Semicircular Ambro Protractor, 5 in. diameter, $\frac{1}{2}°$, . Each, $0 45
1928B. " " " 6 " " $\frac{1}{2}°$, " 60
1928C. " " " 7 " " $\frac{1}{2}°$, " 75
1928D. " " " 8 " " $\frac{1}{2}°$, " 1 20
1929A. Circular " " 6 " " $\frac{1}{2}°$, " 1 50
1929B. " " " 8 " " $\frac{1}{2}°$, " 2 25

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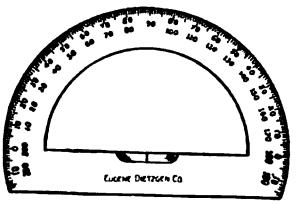
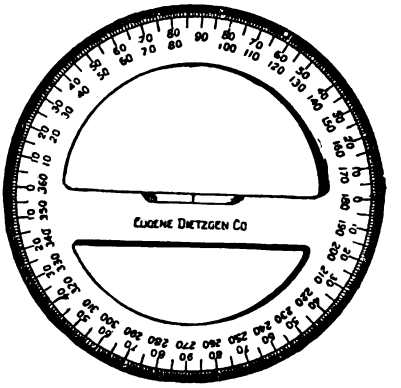
TRANSPARENT AMBRO PROTRACTORS *Continued*

WITH BEVELED EDGES.



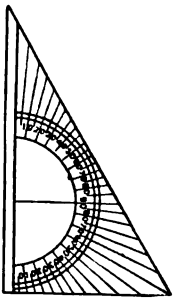
No. 1930A.



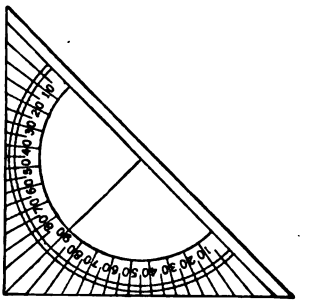
No. 1931 B.

			Each.
No. 1930A.	Semicircular Ambro Protractor, 6 in., beveled edge,	½°,	$2 75
1930B.	" " " 8 " " "	½°,	3 50
1931A.	Circular " " 6 " " "	½°,	3 50
1931B.	" " " 8 " " "	½°,	4 50
1931C.	" " " 10 " " "	½°,	5 50

TRIANGLE AMBRO PROTRACTORS



No. 1933–5.



1934–5.

			Each.
No. 1933–5.	Triangle Ambro Protractor,	30°×60°, 5 in., div. to 1°,	$0 45
1933–6.	" " "	30°×60°, 6 " " 1°,	50
1933–7.	" " "	30°×60°, 7 " " 1°,	70
1934–5.	" " "	45°, 5 " " 1°,	50
1934–6.	" " "	45°, 6 " " 1°,	70
1934–7.	" " "	45°, 7 " " 1°,	90

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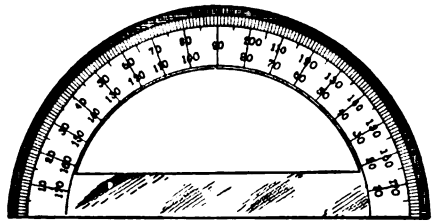
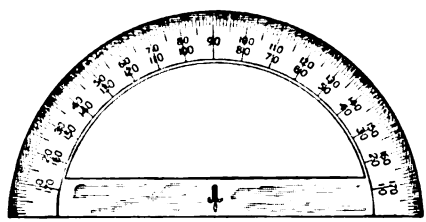
BRASS PROTRACTORS



No. 1936.

No. 1935.	Semicircular, nickel plated,		3½ in. diameter,		1°, . .	Each,	$0 08
1935½.	"	Brass,	3½ "	"	1°, . .	"	12
1936.	"	"	4¼ "	"	1°, . .	"	25
1937.	"	"	5⅛ "	"	½°, . .	"	50
1938.	"	"	6⅜ "	"	½°, . .	"	75

GERMAN SILVER PROTRACTORS



No. 1941.

No. 1940.	Semicircular, German Silver,		4¼ in. diameter,		1°, . .	Each,	$0 50
1941.	"	"	"	5⅛ "	"	½°, . .	" 75
1941½.	"	"	"	6 "	"	½°, . .	" 80
1942.	"	"	"	6⅜ "	"	½°, . .	" 90
1943.	"	"	"	7½ "	"	½°, . .	" 1 20
1944.	"	"	"	8½ "	"	½°, . .	" 1 50

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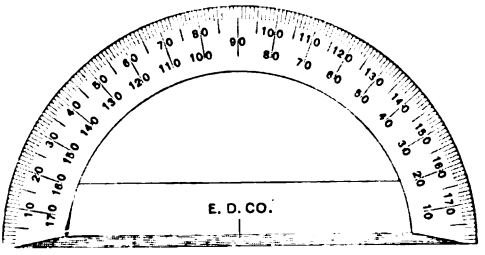
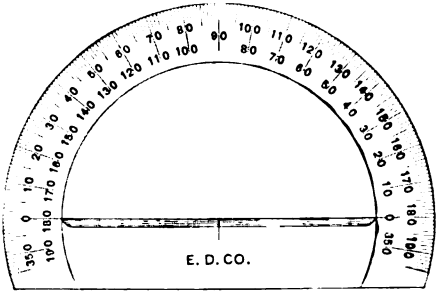
GEM UNION PROTRACTORS



No. 1950.

Center on Outer Edge.

No. 1950.	Semicircular,	German Silver,	4 in.,	beveled edge,	1°,	.	Each,	$1	40
1951.	"	"	5 "	"	"	½°,	.	"	1	75
1952.	"	"	6 "	"	"	½°,	.	"	2	40
1953.	"	"	6 "	"	"	¼°,	.	"	3	00
1954.	"	"	7 "	"	"	½°,	.	"	3	25
1955.	"	"	8 "	"	"	½°,	.	"	4	15



No. 1960.

Center on Inner Edge.

No. 1960.	Semicircular,	German Silver,	4 in.,	beveled edge,	1°,		Each,	$1	50
1961.	"	"	5 "	"	"	½°,		"	2	00
1962.	"	"	6 "	"	"	½°,		"	2	40
1963.	"	"	6 "	"	"	¼°,		"	3	00

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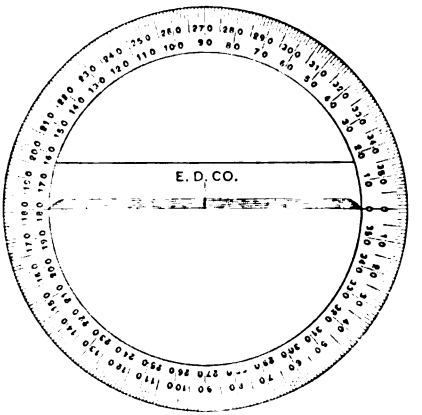
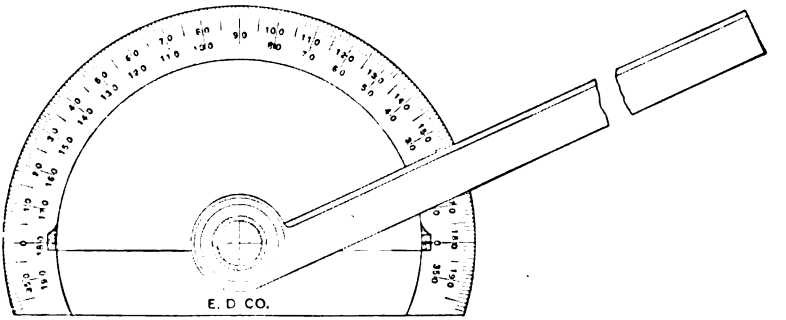
GEM UNION PROTRACTORS *Continued*



No. 1965.

No. 1965. Circular, German Silver, 5 in., ½ degree, beveled edge, . **Each, $5 50**



No. 1970.

Semicircular with Movable Arm and Horn Center.

No. 1970. Semicircular, German Silver, 6 in., ½ degree, length of arm beyond outer edge, 6 in., ... **Each, $8 25**

1971. Semicircular, German Silver, 7 in., ½ degree, length of arm beyond outer edge, 6½ in., ... " 9 50

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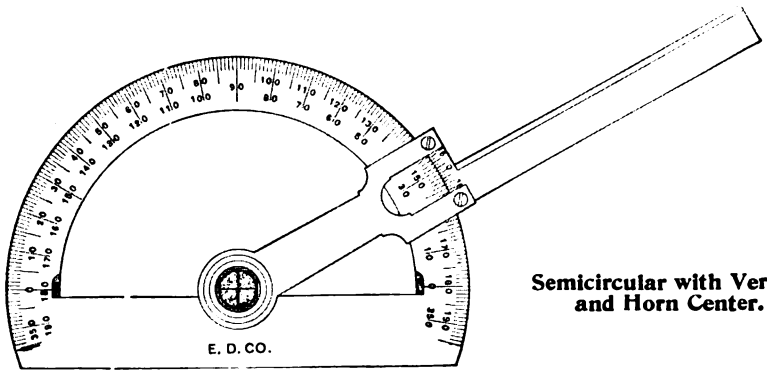


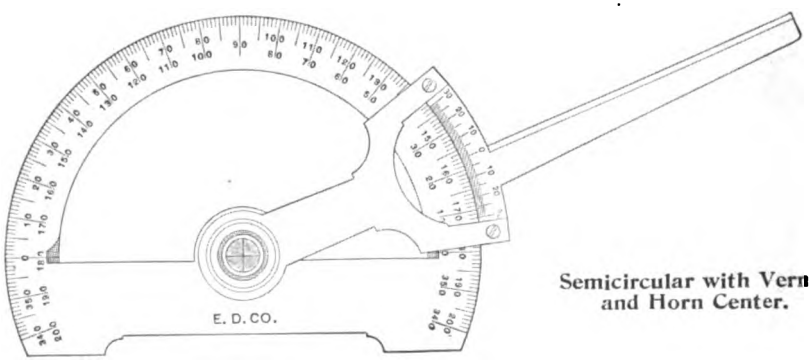
Semicircular with Vernier and Horn Center.

No. 1975.

No. 1975.	German Silver,	5	in.,	½	deg.,	Vernier reading to	3	min.,	Each,			$10	50
1976.	"	"	8	"	¼	"	"	"	"	1	"	"	14	00
1977.	"	"	10	"	¼	"	"	"	"	1	"	"	17	00

Length of arm beyond outer edge of Protractors, ... Nos. 1975, 5½ in.; 1976, 6 in.; 1977 6½ in.

Morocco leather case, silk velvet lined, Each, ... $3 50 $4 00 $4 50



Semicircular with Vernier and Horn Center.

No. 1978.

No. 1978.	German Silver,	8	in.,	½	deg.,	Vernier reading to	1	min.,	Each,			$16	00
1979.	"	"	10	"	½	"	"	"	"	1	"	"	19	25

Length of arm beyond outer edge of Protractors, Nos. 1978, 6 in.; 1979, 6½ in.

Morocco leather case, silk velvet lined, . . Each, $4 00 $4 50

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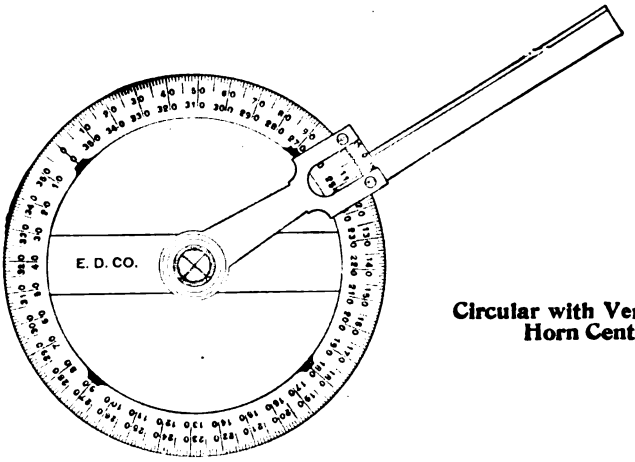
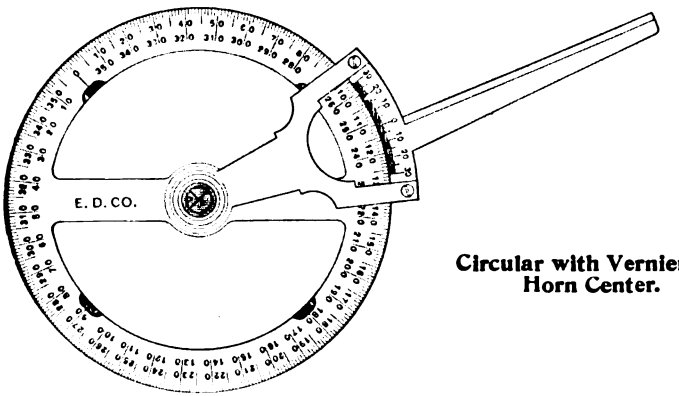
GEM UNION PROTRACTORS *Continued*



Circular with Vernier and Horn Center.

No. 1980.

No. 1980. German Silver, 5½ in., ½ deg., Vernier reading to 3 min., Each, $14 50
1981. " " 8 " ½ " " " " 1 " " 16 00
1982. " " 10 " ½ " " " " 1 " " 20 00
Length of arm beyond outer edge of
Protractors, ... Nos. 1980, 5½ in.; 1981, 6 in.; 1982, 6½ in.
Morocco leather case, silk velvet lined,
Each, ... $4 00 $4 50 $5 00



Circular with Vernier and Horn Center.

No. 1985.

No. 1985. German Silver, 8 in., ½ deg., Vernier reading to 1 min., Each, $18 50
1986. " " 10 " ½ " " " " 1 " " 22 50
Length of arm beyond outer edge of Protractors, Nos. 1985, 6 in.; 1986, 6½ in.
Morocco leather case, silk velvet lined, . . Each, $4 50 $5 00

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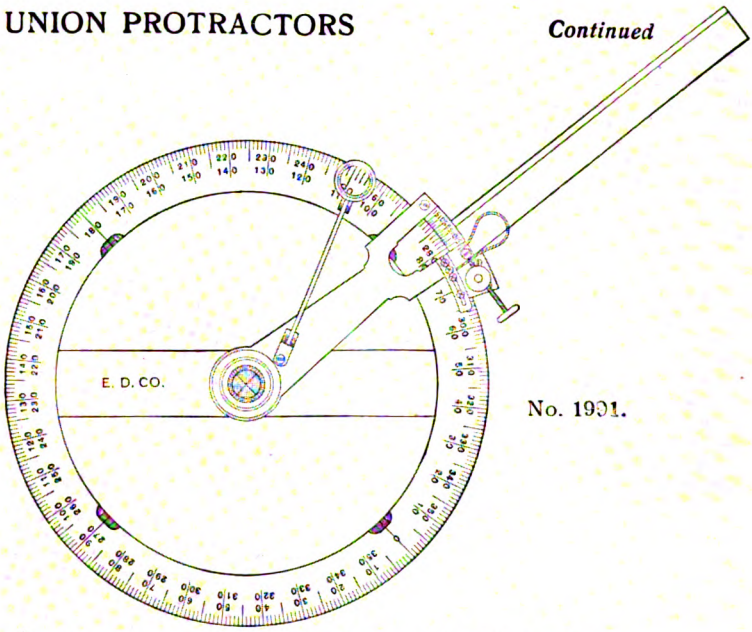
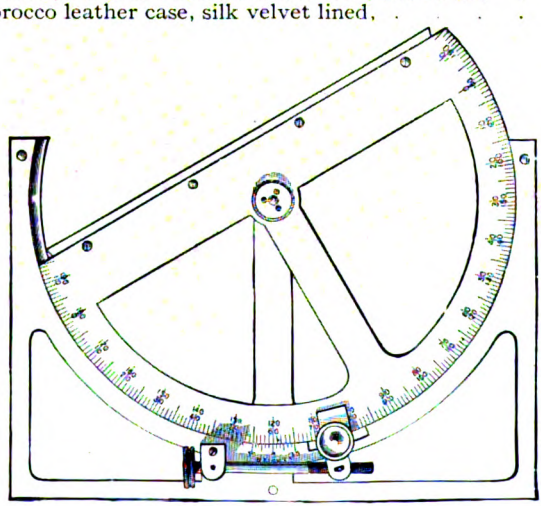
GEM UNION PROTRACTORS *Continued*



No. 1991.

No. 1991. Circular, German Silver, 8 in., ¼ degree, Vernier reading to 1 minute, with clamp screw, micrometer adjusting screw to vernier and magnifying lens, ... Each, $23 50
Morocco leather case, silk velvet lined, ... " 5 00
1992. Circular, German Silver, like No. 1991, but 10 in., . . " 27 50
Morocco leather case, silk velvet lined, ... " 5 50



No. 1993.

No. 1993. Crozet Protractor, German Silver, 8 in., graduated to ½ degree; folded vernier reading to minutes, with clamp and tangent screws, in polished wooden case, . . Each, $40 00

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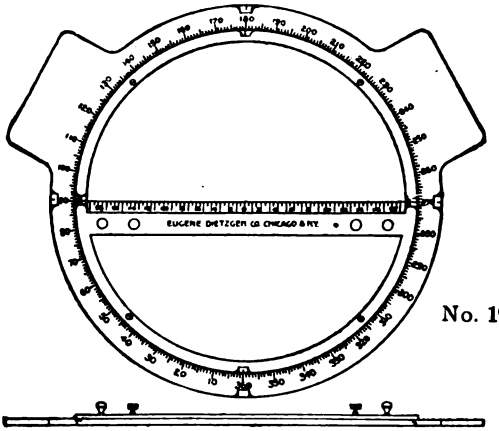
COLBY'S PROTRACTOR

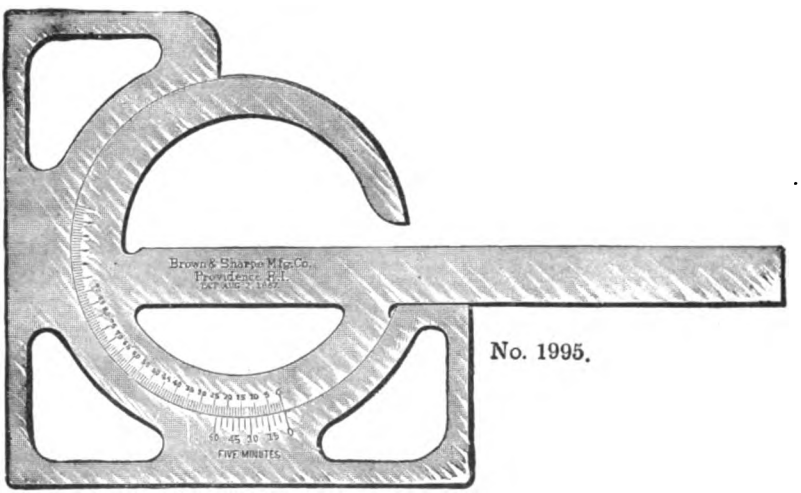
Patented Oct. 3, 1893.



No. 1994.

No. 1994. Colby's Protractor, German Silver, Limb 12 in., divided to 15 minutes, Scale graduated as required, in case, Each, $60 00

DRAFTSMAN'S PROTRACTOR



No. 1995.

No. 1995. Draftsman's Steel Protractor, with directions, . . Each, $6 50
1995½. " " " in morocco case, . . " 7 75

This Protractor is made from sheet steel and has a blade 8¼ inches long. The graduations read to degrees and the vernier reads to five minutes.

There are no projections on either face of the Protractor; and consequently it can be used on either edge of the blade or either side up. This makes it particularly convenient in dividing circles, transferring angles, drawing oblique lines at right angles to each other, or laying off given angles each side of a vertical or horizontal line without changing the setting.

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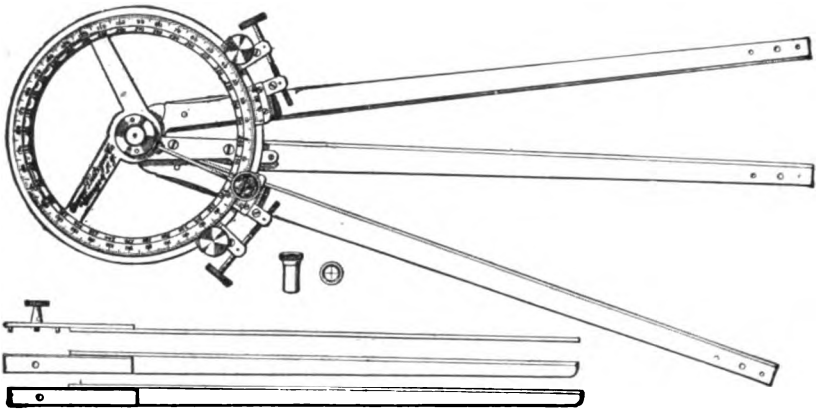
THREE ARM PROTRACTOR



No. 1996.

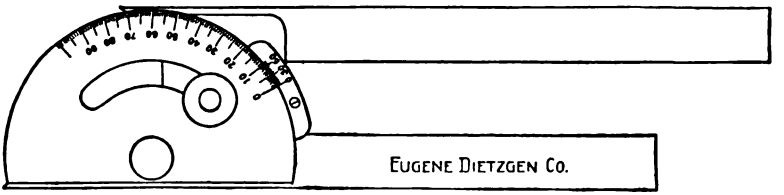
No. 1996. Three Arm Protractor or Station Pointer, in hardwood case, with screwdriver and accessories, ... Each, **$87 50**

As made by us for the U. S. Navy. The circle is 6½ inch diameter, made of bronze, graduated on solid silver, and numbered by two rows of figures reading in opposite directions, from 0 to 360.

The arms are 18 inches long, made of German silver, and have extensions of 13½ inches; the two movable arms are provided with clamp and tangent screws and verniers reading to single minutes.

The magnifier is pivoted and hinged to the center of the circle, and moves parallel to the graduation. The instrument is also provided with three interchangeable cylindrical centers, one with glass bottom, one with horn bottom having a small hole for pencil point, and one with spring needle point for locating the exact position.

DRAFTSMAN'S STEEL PROTRACTOR



No. 1997A.

No. 1997A. Draftsman's Steel Protractor, ... Each, **$4 00**
1997B. " " " in Mahogany case, . " **5 00**

This Protractor has spring-tempered blades about 9 inches long. The arc is four inches in diameter, graduated to degrees, with a vernier reading to five minutes. It has a clamping screw that securely holds the blades at any angle and also serves as a knob.

Either blade can be used in contact with a T square, giving any angle and its complement from 0° to 90°.

It forms a perfect adjustable triangle, and is nicely finished. It is a convenient and reliable tool.

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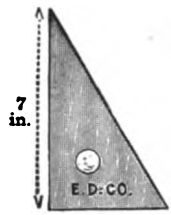
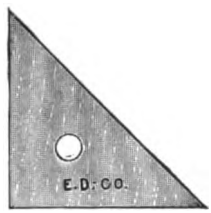
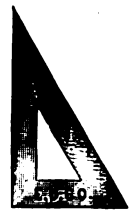
WOODEN TRIANGLES

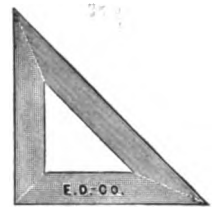
Our Triangles are perfect in workmanship and finish, and are made of thoroughly seasoned wood. They are very durable, and will retain their accuracy longer than any other make.

The size of all Triangles is determined by the length of the catheti indicated by the dotted lines. In order to secure a 30°×60° and a 45° degree Triangle of even size of hypothenuse, order the 45° Triangle about 2 inches shorter than the 30°×60° Triangle.



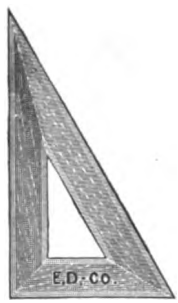


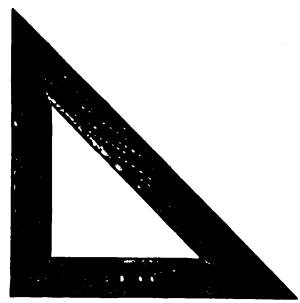




No. 2000. 2001. 2006. 2007.

No. 2000.	Cherry Triangles, solid, 30°×60°,	Size,	7			9	in.
		Each,	$0 08			10	
2001.	Cherry Triangles, solid, 45°,	Size,	5¼			7⅛	in.
		Each,	$0 08			10	
2002.	Cherry Triangles, framed, mortised joints, 30°×60°,	Size,	8	10	12	14	in.
		Each,	$0 12	16	20	24	
2003.	Cherry Triangles, framed, mortised joints, 45°,	Size,	6	8	10	12	in.
		Each,	$0 12	16	20	24	
2006.	Pearwood Triangles, framed, extra quality, 30°×60°,	Size,	8	10	12	14	in.
		Each,	$0 18	24	30	36	
2007.	Pearwood Triangles, framed, extra quality, 45°,	Size,	6	8	10	12	in.
		Each,	$0 18	24	30	36	





No. 2010. 2011.

No. 2010.	Hardwood lined Triangles, mortised joints, 30°×60°,	Size,	8	10	12	14	17 in.
		Each,	$0 25	30	40	50	75
2011.	Hardwood lined Triangles, mortised joints, 45°,	Size,	6	8	10	12	14 in.
		Each,	$0 25	30	40	50	75

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WOODEN TRIANGLES *Continued*

No. 2012.

2013.

No. 2012. Mahogany, Ebony Lined Triangles, mortised joints, 30°×60°,

Size,	8	10	12	14	17	20 in.
Each,	$0 35	40	55	75	1 20	1 50

2013. Mahogany, Ebony Lined Triangles, mortised joints, 45°,

Size,	6	8	10	12	14	17 in.
Each,	$0 35	40	55	75	1 20	1 50

BLACK AMBRO TRIANGLES

Our tools of "Black Ambro" are far superior to Hard Rubber, as they do not assimilate dust nor smudge the drawing paper, and, unlike Hard Rubber, are not liable to break when dropped.

No. 2018.

2020.

No. 2018. Black Ambro Triangles, 30°×60°,

Size,	4	5	6	7	8	9	10	12	14	16	18 in.
Each,	$0 15	20	25	30	35	40	45	60	1 00	1 50	2 00

2020. Black Ambro Triangles, 45°,

Size,	3	4	5	6	7	8	9	10	12	14	16 in.
Each,	$0 15	25	30	35	40	45	55	60	1 00	1 50	2 20

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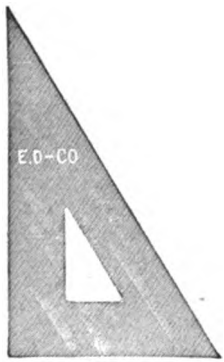
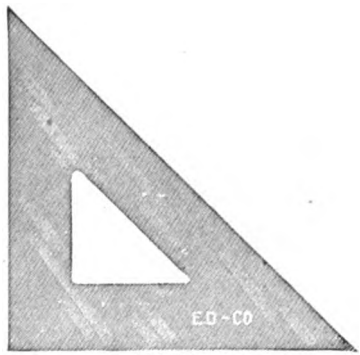
TRANSPARENT AMBRO TRIANGLES

All our tools of **"Transparent Ambro"** are made of the finest material obtainable and have the following high qualities, viz.: they are allowing of more rapid and accurate work, owing to their transparency; they do not assimilate dust; they keep their edges almost like metal tools. We claim some credit for having first put them on the market.

REGULAR STYLE.



No. 2021.



2022.

No. 2021. Transparent Ambro Triangles, 30°×60°,

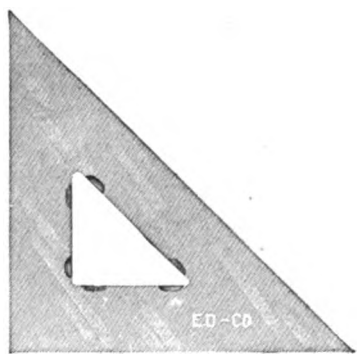
Size,	4	5	6	7	8	9	10	11	12	14	16	18 in.
Each,	$0 20	30	35	40	50	60	70	80	95	1 55	2 35	3 20

2022. Transparent Ambro Triangles, 45°,

Size,	3	4	5	6	7	8	9	10	12	14	16 in.
Each,	$0 25	30	40	50	60	70	90	1 05	1 55	2 10	3 00

WITH BEVELS ON INNER EDGES.

No. 2021B.



2022B.

No. 2021B. Transparent Ambro Triangles, 30°×60°, beveled on inner edges.

Size,	4	5	6	7	8	9	10	11	12	14	16	18 in.
Each,	$0 25	35	40	45	55	65	75	85	1 00	1 65	2 50	3 30

2022B. Transparent Ambro Triangles, 45°, beveled on inner edges.

Size,	3	4	5	6	7	8	9	10	12	14	16 in.
Each,	$0 30	35	45	55	65	75	95	1 10	1 65	2 20	3 15

Nos. 2021B and 2022B have bevels on their inner edges from opposite surfaces. By catching finger nail under the bevel when taking hold, they can be picked up more readily than the regular style, and at the same time lessen the liability of blurring fresh ink lines.

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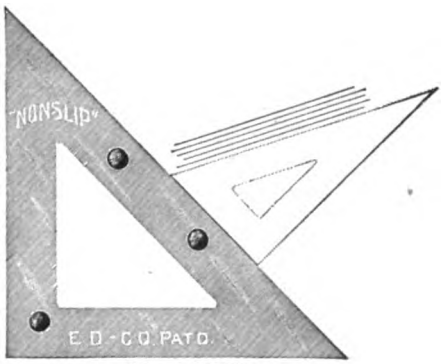
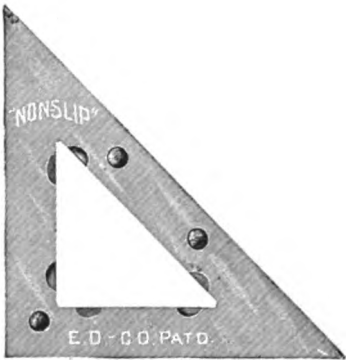
TRANSPARENT AMBRO TRIANGLES *Continued*

THE "NON-SLIP" TRIANGLE

Patented



No. 2022N



2022P.

Most all draftsmen in the manipulation of two triangles have experienced an irritating sense of inability to always keep the triangle under the left hand from slipping, while the triangle under the right hand was being shifted or reversed, or held for drawing the desired lines. This is particularly true when working on tracing cloth, or hard surface drawing paper.

The triangle here illustrated eliminates this tendency to slip and with use will relieve the muscular tension in the arm and hand that is often exerted and maintained when it is desired to avoid losing time.

The "Non-Slip" Triangle is made of transparent ambro, and is provided with three soft rubber discs, set through holes in the triangle, so as to have friction contact with the drawing, and yet allow the triangle to lay close to the surface when held with a light pressure of the hand. Its use will be of particular advantage for section lining or shading in all instances where the use of a T Square and triangle, or a parallel ruler, is not practicable.

We do not recommend this device for use in all triangles or in small sizes. It is only the stationary triangle that needs the attachment, and one 45° eight inches or over in size, in a set of three or four, will be sufficient.

Cross Section showing normal shape of rubber disc.

Cross Section showing shape of rubber disc when triangle is in use.

No. 2022N.	"Non-Slip" Transparent Ambro Triangles, 45°, regular style.				
	Size,	8	10	12	14 in.
	Each,	$1 00	1 35	1 85	2 40
2022P.	"Non-Slip" Transparent Ambro Triangles, 45°, beveled on inner edges.				
	Size,	8	10	12	14 in.
	Each,	$1 05	1 40	1 95	2 50
2022R.	Extra Rubber Discs,			Per set of 3,	$0 25

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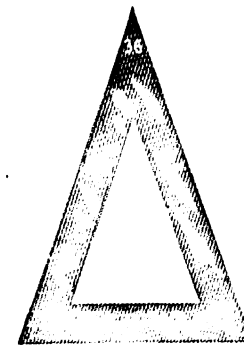
TRANSPARENT AMBRO TRIANGLES *Continued*

No. 2023.

2023B.



2023½.

No. 2023. Transparent Ambro Triangles, 22½°×67½°, regular.

Size,	4	6	8	10	12	14	16 in.
Each,	$0 20	35	50	70	95	1 55	2 35

2023B. Transparent Ambro Triangles, 22½°×67½°, beveled on inner edges.

Size,	4	6	8	10	12	14	16 in.
Each,	$0 25	40	55	75	1 00	1 65	2 50

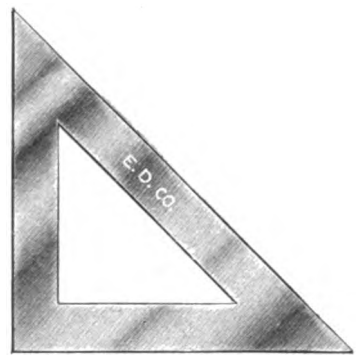
2023½. Transparent Ambro Triangles, *isosceles*; base angles 72°, vertical angle 36°.

Size,	4	6	8	10	12 in.
Each,	$0 45	55	75	1 10	1 45

The Isosceles Triangle was designed by John J. Quinn, a prominent teacher of mathematics and manual training, and is of practical value for designers, as by its use new designs involving the pentagon will be suggested. In manual training school work it will aid in obtaining many new designs, without the solving of difficult problems.

STEEL TRIANGLES

No. 2024.



2025.

No. 2024. Steel Triangles, nickel-plated, 30°×60°.

Size,	6	7	8	10	15 in.
Each,	$3 20	3 50	3 85	4 25	6 50

2025. Steel Triangles, nickel-plated, 45°.

Size,	5	6	8	10	12 in.
Each,	$3 20	3 50	4 25	5 50	6 50

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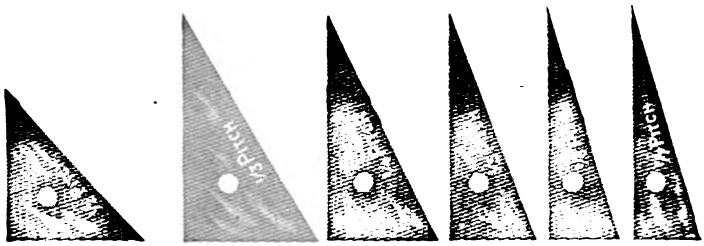
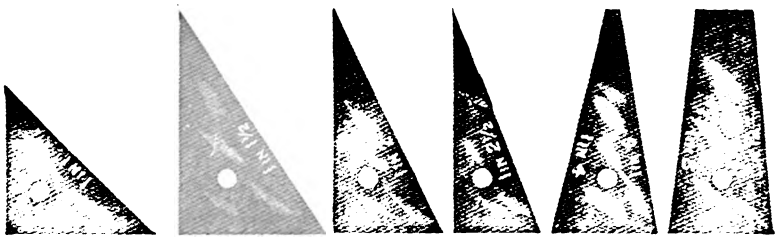
TRIANGLES FOR ROOF PITCHES AND EMBANKMENTS



No. 2026.

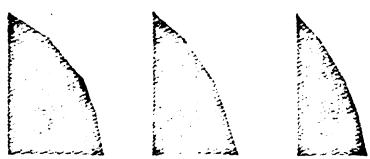
No. 2026. Transparent Ambro Triangles for Roof Pitches, 6 in set,
Per set, ... $2 80; Each, $0 55



No. 2026½.

No. 2026½. Transparent Ambro Triangles for Embankments, 8 slopes on 6 Templets, Per set, ... $4 25; Each, $0 80

LETTERING TRIANGLES



No. 2028½.

No. 2028. Lettering Triangles of Black Ambro, 3½ in., Per set of 3, $1 20
2028½. " " " Trans. " 3½ " " " 3, 1 50

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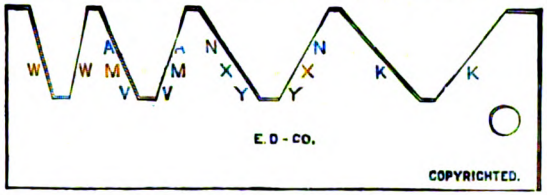
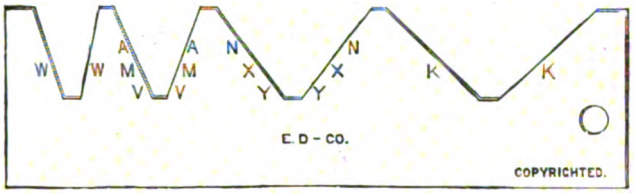
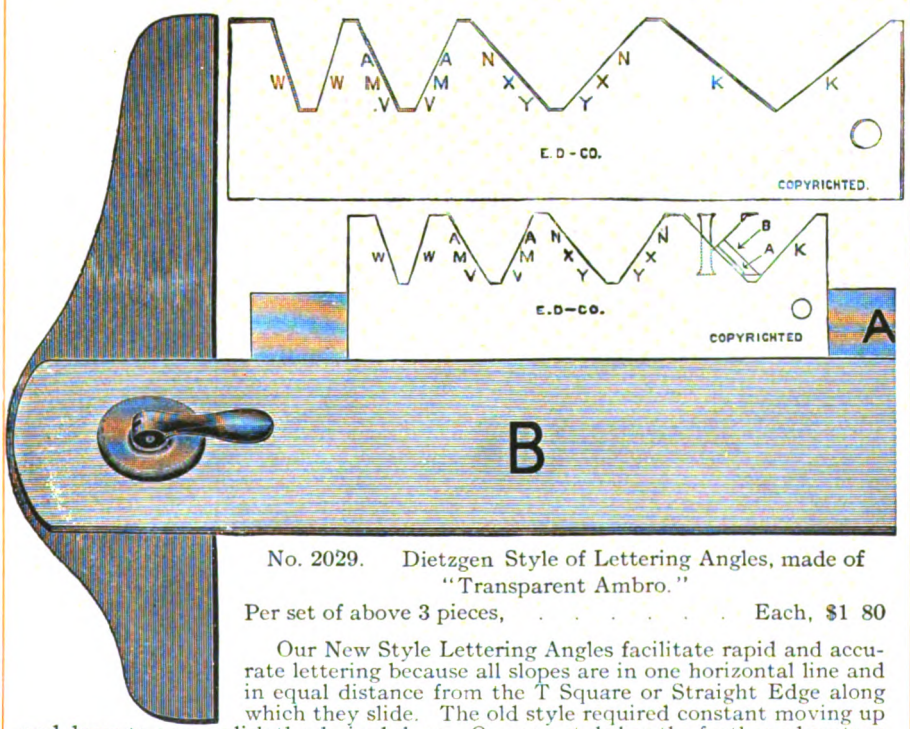
DIETZGEN STYLE OF LETTERING ANGLES



Illustrations ½ size.





No. 2029. Dietzgen Style of Lettering Angles, made of "Transparent Ambro."

Per set of above 3 pieces, ... Each, $1 80

Our New Style Lettering Angles facilitate rapid and accurate lettering because all slopes are in one horizontal line and in equal distance from the T Square or Straight Edge along which they slide. The old style required constant moving up and down to accomplish the desired slope. Our new style has the further advantage that it permits of inking the letters without risk of blurring the lines. Put a piece of cardboard or blotting paper "A" next to edge of T Square "B" and under the lettering angle, thus raising the lettering angle over the drawing paper. In this way you could ink slope "A" of the letter "K," and while that line is still wet slide along the angle to draw slope "B," as shown by above cut.

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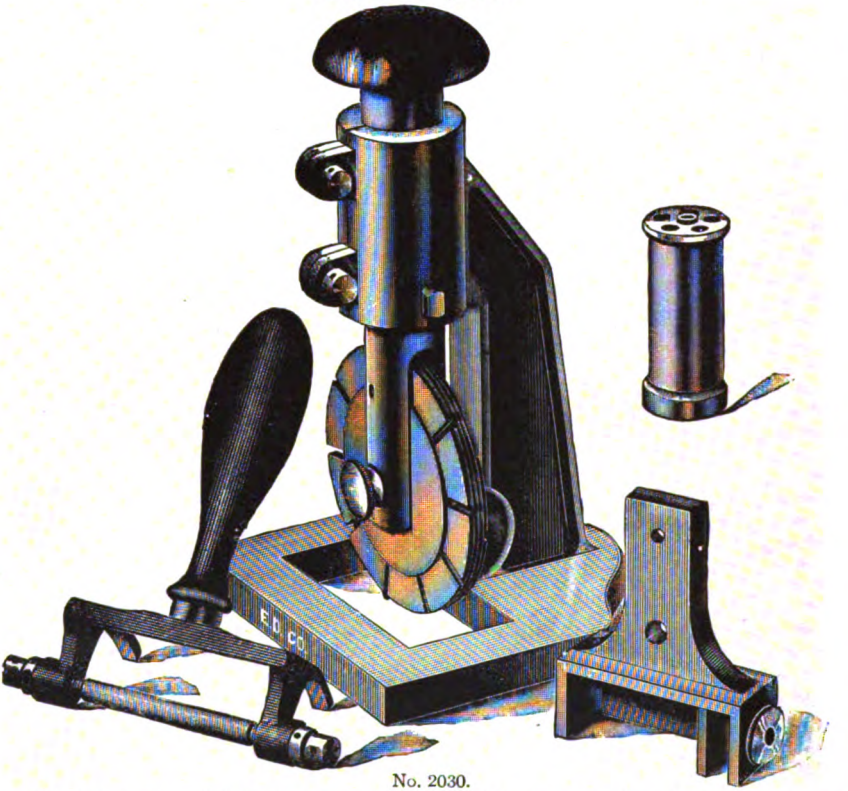
LETTERING DEVICE

Specially Invaluable to U. S. and City Engineers for Fine Map Work.

Illustration ½ size.



No. 2030.

This instrument, as it is illustrated above, is designed to increase at least tenfold the accuracy and rapidity with which pen-work in all kinds of lettering on maps, plans and drawings may be accomplished. The work can be done at an astonishingly small cost, and in quality it will be found satisfactory to the most fastidious.

This device solves the problem how to repeat a word or combination of figures upon a map or drawing as often as may be required. It has met the approbation of all who had occasion to use or see it. The applications are almost **unlimited, as will readily be seen**.

The construction is very simple; the base and upright are of one casting, to which is accurately fitted a vertical slide that receives the type-box or dials, as the case may be. These attachments are fastened by means of a milled head screw, as shown in cut. The slide is provided with a slot and key to insure a perfect vertical motion without any lateral play. The front edge of base is made exactly parallel with the dials and type-box, so that the regular T square or straight edge may be used to slide the instrument along where a number of figures are to be printed in a straight line.

The type-box, 2¼ inches long and ⅝ inches wide, is intended to receive the word or combination of characters which are to be used in a given class of work. The type is fastened in the ordinary manner by means of a clamp-screw. Into the dials are to be inserted the figures, about ⅛ inch high and smaller, from 0 to 9, and there being four of these dials, it will be seen that any combination of figures containing four numbers may be printed at one time.

To apply the ink, which has previously been prepared on a piece of plate glass about 4 x 6 inches, invert the apparatus, press the vertical slide so that the type will project through the base, pass over the type with the ink roller, and the instrument is ready for use.

The whole instrument is made of hard brass, is nicely finished, and is packed in a neat box with one set of four dials, type-box, mould for ink rollers and two holders of ink rollers.

No. 2030. Lettering Device, complete, without type, ... Each, **$36 00**

The cost of type will vary according to the amount and kind, which can be selected from a catalogue of any type founder, and may range from $3 00 upward.

Secure the ink and ink rollers from a printing supply house.

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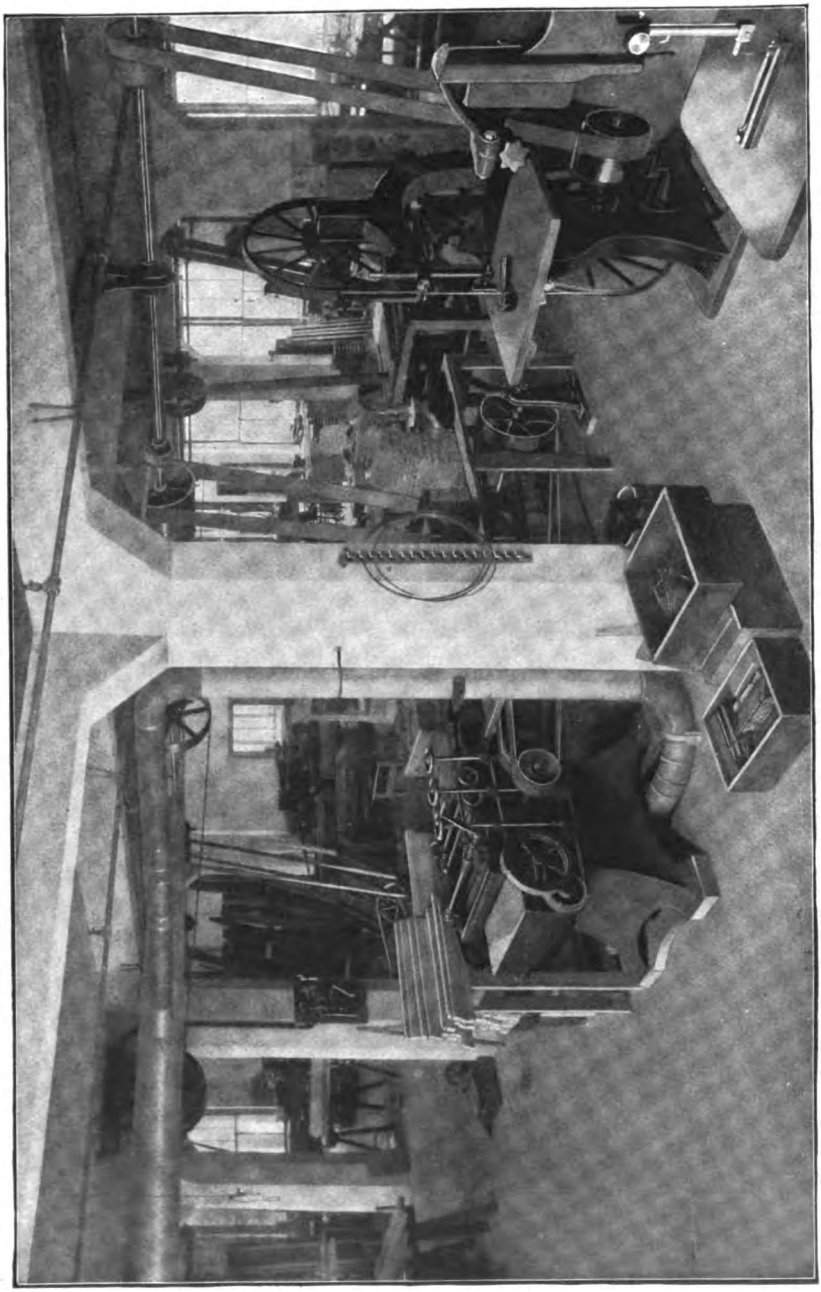

WOODWORKING DEPARTMENT—FACTORY

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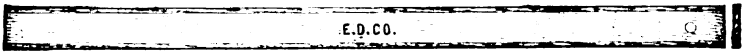
STRAIGHT EDGES

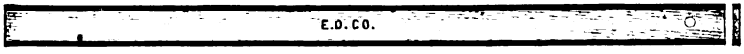
No. 2050. Cherry or Maple, one edge beveled,

Size,	18	24	30	36	42	in.
Each,	$0 20	25	30	40	50	



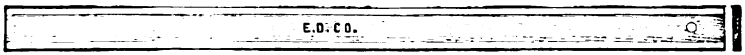
No. 2051. Hardwood lined, square edges,

Size,	24	30	36	42	48	54	60	72	in.
Each,	$0 35	45	60	75	1 00	1 20	1 50	2 00	



No. 2052. Mahogany, Ebony Lined, square edges,

Size,	24	30	36	42	48	54	in.
Each,	$0 50	60	80	1 00	1 35	1 60	



No. 2056. Transparent Ambro Lined, square edges, grooved joint,

Size,	18	24	30	36	42	48	in.
Each,	$0 75	1 00	1 25	1 50	1 80	2 20	

No. 2057. Steel Straight Edges, nickel plated, one edge beveled.

Size,	15	18	24	30	36	42	48	60	72 in.
Each,	$1 75	2 00	3 00	4 00	5 00	6 50	8 00	11 00	15 00

No. 2058. Steel Straight Edges, nickel plated, square edges.

Size,	15	18	24	30	36	42	48	60	72 in.
Each,	$1 10	1 25	1 90	2 75	3 50	4 50	6 00	8 50	12 00

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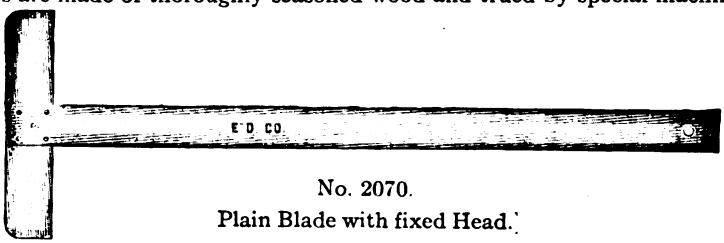
WOODEN T SQUARES

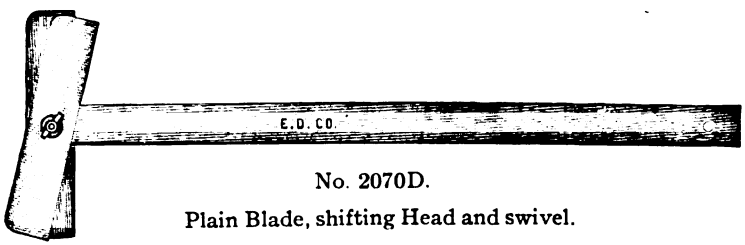
To insure the desirable qualities of trueness and durability, T Squares must be made of carefully selected stock and be of perfect workmanship. All our T Squares are made of thoroughly seasoned wood and trued by special machines.



No. 2070.

Plain Blade with fixed Head.

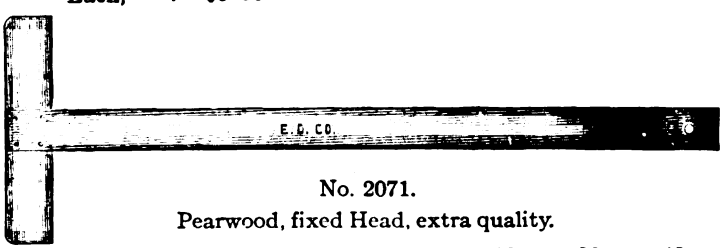
No. 2070.	Size,	15	18	24	30	36	42	48 in.
	Each,	$0 15	20	25	30	40	45	65



No. 2070D.

Plain Blade, shifting Head and swivel.

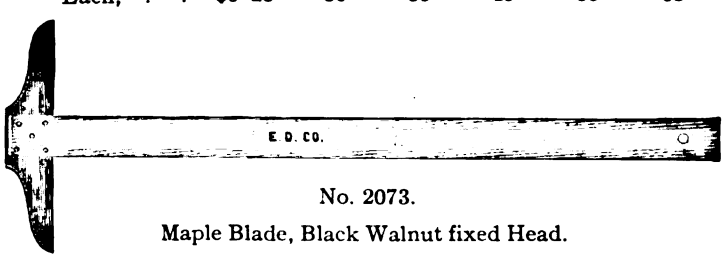
No. 2070D.	Size,	15	18	24	30	36	42	48 in.
	Each,	$0 50	60	70	80	90	1 00	1 20



No. 2071.

Pearwood, fixed Head, extra quality.

No. 2071.	Size,	15	18	24	30	36	42	48 in.
	Each,	$0 25	30	35	45	55	65	90



No. 2073.

Maple Blade, Black Walnut fixed Head.

No. 2073.	Size,	24	30	36	42	48	54 in.	
	Each,	$0 60	75	90	1 05	1 20	1 40	

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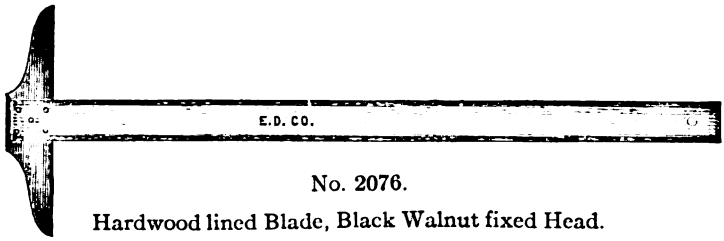
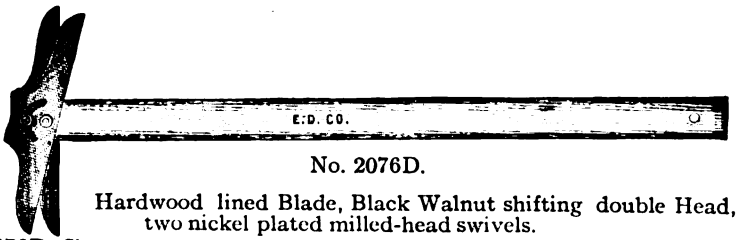
WOODEN T SQUARES *Continued*



No. 2076.

Hardwood lined Blade, Black Walnut fixed Head.

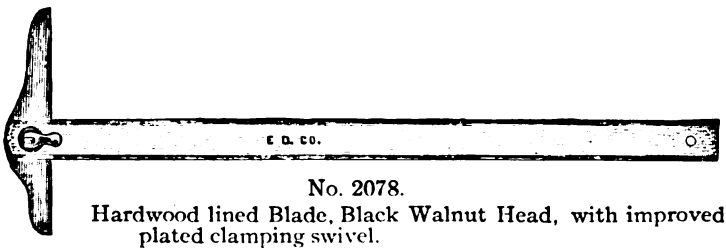
No. 2076. Size,	24	30	36	42	48	54	60	72 in.
Each,	$0 75	90	1 05	1 25	1 50	1 75	2 25	3 00



No. 2076D.

Hardwood lined Blade, Black Walnut shifting double Head, with two nickel plated milled-head swivels.

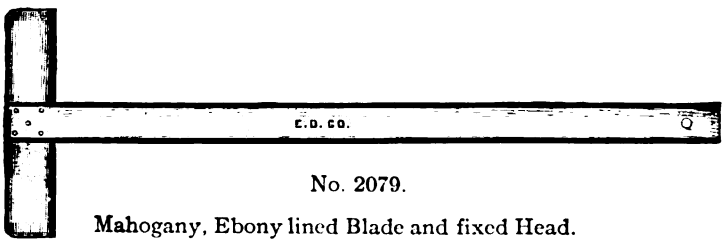
No. 2076D. Size,	24	30	36	42	48	54	60	72 in.
Each,	$1 35	1 50	1 65	1 85	2 15	2 50	3 00	4 00



No. 2078.

Hardwood lined Blade, Black Walnut Head, with improved nickel plated clamping swivel.

No. 2078. Size,	24	30	36	42	48	54	60	72 in.
Each,	$1 35	1 50	1 65	1 85	2 15	2 50	3 00	4 00



No. 2079.

Mahogany, Ebony lined Blade and fixed Head.

No. 2079. Size,	24	30	36	42	48	54	60 in.
Each,	$0 90	1 10	1 30	1 50	1 75	2 10	2 60

For Patent T Square Guide see No. 2100.

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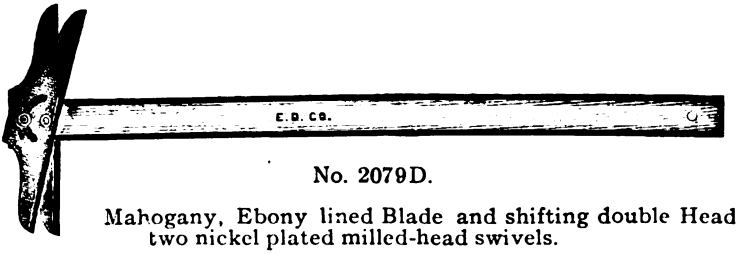
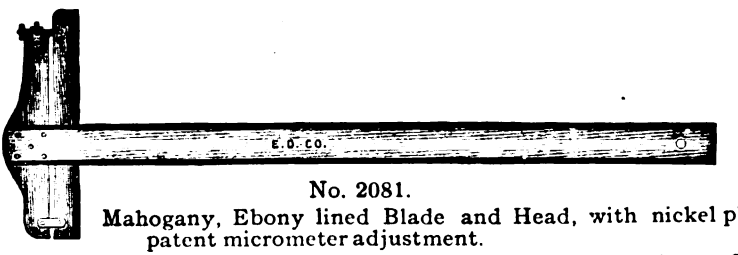


No. 2079D.

Mahogany, Ebony lined Blade and shifting double Head, with two nickel plated milled-head swivels.

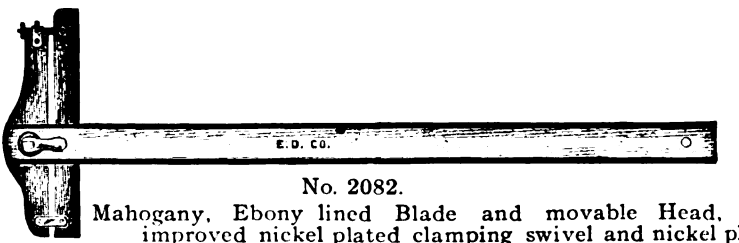
No. 2079D. Size,	24	30	36	42	48	54	60 in.
Each,	$1 75	2 00	2 25	2 50	2 80	3 25	3 90



No. 2081.

Mahogany, Ebony lined Blade and Head, with nickel plated patent micrometer adjustment.

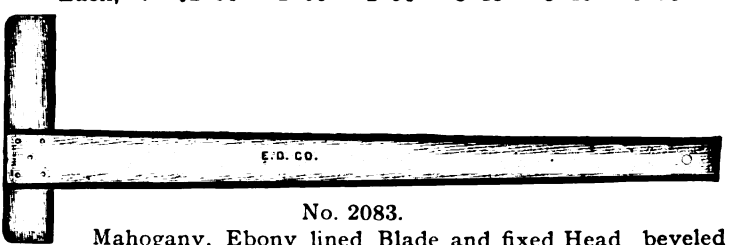
No. 2081. Size,	24	30	36	42	48	54	60 in.
Each,	$1 65	1 90	2 15	2 40	2 65	3 15	3 65



No. 2082.

Mahogany, Ebony lined Blade and movable Head, with improved nickel plated clamping swivel and nickel plated patent micrometer adjustment.

No. 2082. Size,	24	30	36	42	48	54	60 in.
Each,	$2 50	2 65	2 90	3 15	3 40	3 90	4 40



No. 2083.

Mahogany, Ebony lined Blade and fixed Head, beveled edge. The blade is tapered to prevent spring or bending.

No. 2083. Size,	30	36	42	48	54 in.
Each,	$1 20	1 40	1 60	1 85	2 25

For Patent T Square Guide see No. 2100.

Other styles of T Squares with fixed or swivel Heads made to order at short notice.

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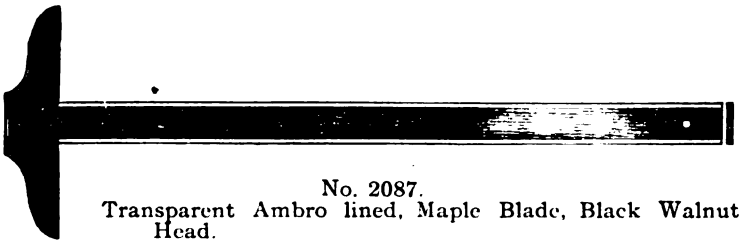
IMPROVED TRANSPARENT AMBRO LINED T SQUARES

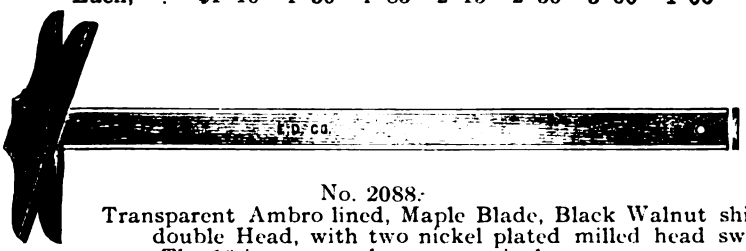
With Tongue and Groove Joint.

The principal advantage of this improved construction lies in the fact that the gluing surface has been almost doubled, thereby lessening the liability of blade warping, and at the same time absolutely eliminating all possibility of the celluloid strip from becoming detached from the wooden blade.



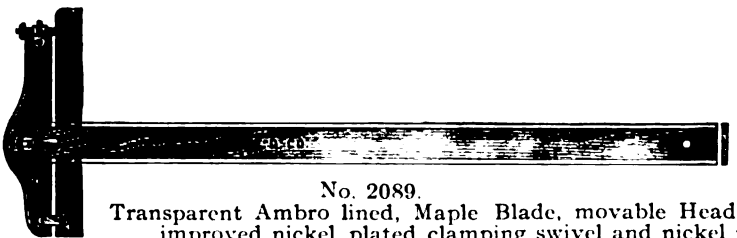
No. 2087.
Transparent Ambro lined, Maple Blade, Black Walnut fixed Head.

No 2087.	Size,	18	24	30	36	42	48	54	60in.
	Each,	$1 10	1 50	1 85	2 15	2 50	3 00	4 00	5 00



No. 2088.
Transparent Ambro lined, Maple Blade, Black Walnut shifting double Head, with two nickel plated milled head swivels. The 18 in. squares have one swivel.

No. 2088.	Size,	18	24	30	36	42	48	54	60 in.
	Each,	$1 90	2 45	2 80	3 20	3 60	4 20	5 25	6 25



No. 2089.
Transparent Ambro lined, Maple Blade, movable Head, with improved nickel plated clamping swivel and nickel plated patent micrometer adjustment.

No. 2089.	Size,	24	30	36	42	48 in.
	Each,	$3 15	3 50	3 90	4 35	5 00

ORDINARY TRANSPARENT AMBRO LINED T SQUARES
With Plain Glued Joint.

No. 2091. Transparent Ambro lined, fixed Head, like No. 2087, but with plain glued joint.

Size,	18	24	30	36	42	48 in
Each,	$0 90	1 25	1 50	1 75	2 00	2 50

No. 2092. Transparent Ambro lined, shifting double Head, like No. 2088, but with plain glued joint

Size,	18	24	30	36	42	48 in
Each,	$1 65	2 10	2 40	2 70	3 00	3 60

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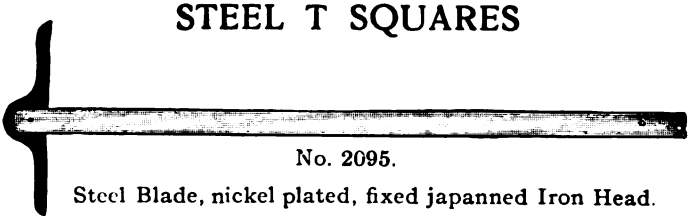
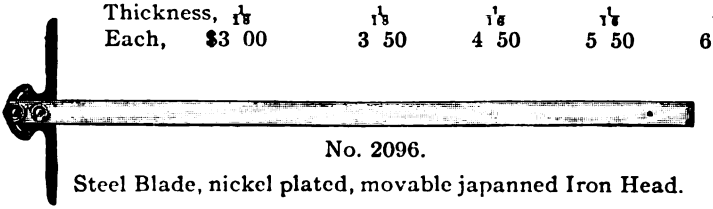
STEEL T SQUARES



No. 2095.

Steel Blade, nickel plated, fixed japanned Iron Head.

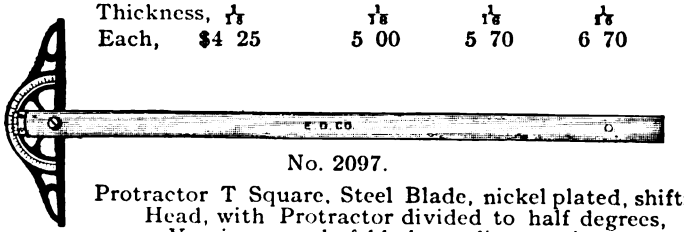
No. 2095. Size,	18	24	30	36	42 in.
Width,	1¼	1¼	1½	1½	1¾ "
Thickness,	1/8	1/8	1/8	1/8	1/4 "
Each,	$3 00	3 50	4 50	5 50	6 50



No. 2096.

Steel Blade, nickel plated, movable japanned Iron Head.

No. 2096. Size,	18	24	30	36	42 in.
Width,	1¼	1¼	1½	1½	1¾ "
Thickness,	1/8	1/8	1/8	1/8	1/4 "
Each,	$4 25	5 00	5 70	6 70	7 70

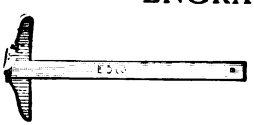


No. 2097.

Protractor T Square, Steel Blade, nickel plated, shifting Head, with Protractor divided to half degrees, Vernier on end of blade reading to minutes.

No. 2097. Size,	24	30	36	42 in.
Width,	1¼	1½	1½	1¾ "
Thickness,	1/8	1/8	1/8	1/4 "
Each,	$8 50	9 50	10 50	11 50

ENGRAVERS' T SQUARES



No. 2098.

No. 2099.

Engravers' T Square, Steel Blade, fixed Head.

No. 2098. Size,	6	8	10	12 in.
Each,	$1 25	1 50	2 00	2 50

Engravers' T Square, Steel Blade, shifting Head, with swivel.

No. 2099. Size,	6	8	10	12 in.
Each,	$1 50	1 75	2 25	2 75

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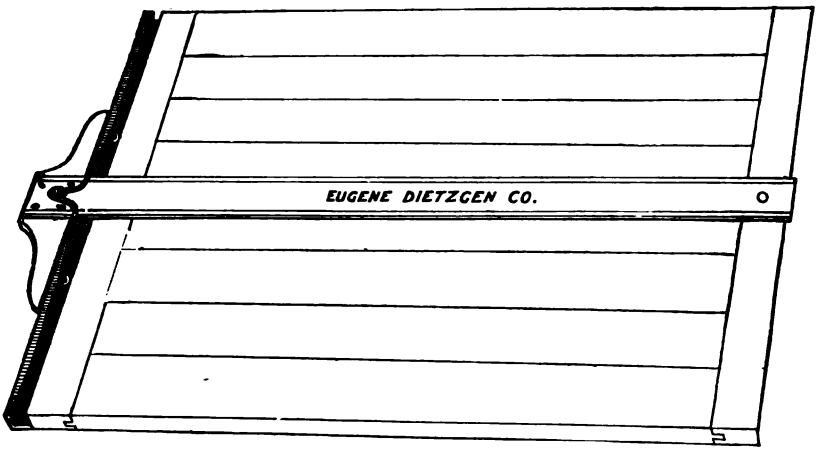
DIETZGEN T SQUARE GUIDE

Patented March 4, 1902.



No. 2100.

No. 2100. T Square Guide, nickel plated, with wooden guide strip, . Each, $1 00

In ordering, please state length of guide strip wanted, which should be full width of drawing board, or longer, if desired, so that square can be moved to extreme end of board.

This is a simple and novel attachment by means of which any ordinary fixed-head T square can be transformed into a perfect parallel ruler with but little trouble and expense. The Guide consists of a nickel-plated spring, made in a strong and substantial manner, having branching arms provided at their extremities with suitable guide rollers, and a guide strip made of hardwood The spring is screwed to fixed head T squares, as shown in illustration, and travels along the wooden guide strip, which is attached to edge of drawing board.

The resilience of spring, which can be easily regulated, permits the T square to move freely along the board, and the friction between head of square and guide strip due to the pressure of the rollers, will hold the square in proper position upon the board when the latter is inclined at an angle.

The draftsman is thus relieved of the constant annoyance of the slipping of the T square, which can be moved at pleasure, and still retain a true line; and, as the draftsman is allowed the free use of both hands, it thus greatly facilitates quick and accurate drafting.

There is no string or wire to break or get out of order, and it requires but a moment to attach or detach our outfit from T square or board.

For T Squares see pages 257-261.

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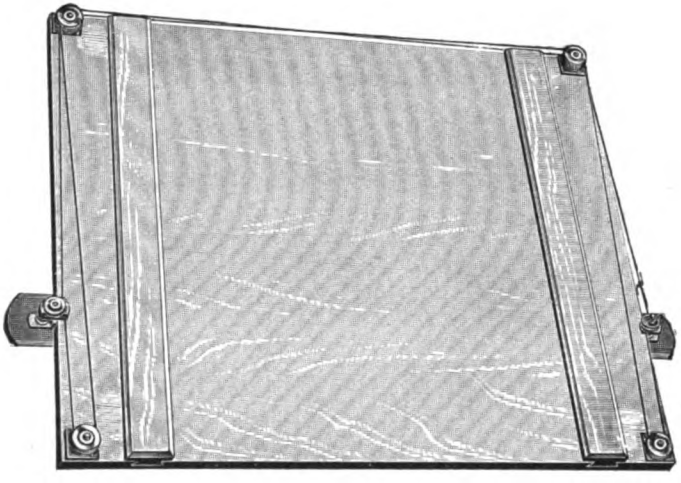
PARALLEL RULING ATTACHMENTS



No. 2102.

View of under side of drawing board, showing attachments.

Our Attachments are of simple construction, neat in appearance, consisting of perfectly constructed brass wheels, mounted on plates, with best quality braided silk line or wire, and a perfect clamping device for clamping same to straight edge. They are easily attached to any drawing board having ledges beneath, or on any frame having an opening into which a drawing board can be placed.

We furnish the Attachments with or without Straight Edge.

ATTACHMENTS ONLY.

	For Drawing Boards. . .	24	31	42	55	60 in. long.
No. 2101.	Attachments, . . Each,	$4 00	4 10	4 25	4 40	4 50

STRAIGHT EDGES AND ATTACHMENTS.

	For Drawing Boards, . .	24	31	42	55	60 in. long.
No. 2102.	Attachm'ts with Hardwood Lined Straight Edge, Each,	$4 50	4 90	5 40	6 10	6 75
2103.	Attachm'ts with Mahogany Ebony Lined St. Edge, Each,	4 75	5 15	5 75	6 70	7 25
2104.	Attachm'ts with Transparent Ambro Lined St. Edge, Each,	5 50	6 00	6 75	8 50	9 50

In ordering Attachments, please state thickness of board and in ordering Straight Edges state exact length of board.

Full directions furnished with each outfit.

For Drawing Boards see pages 280–281.

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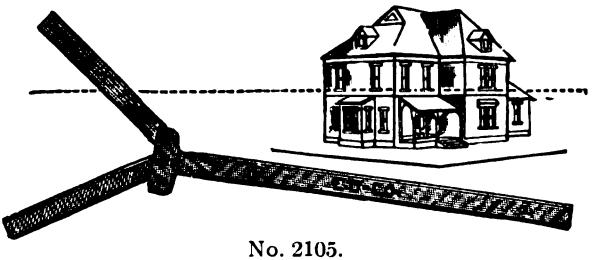
PERSPECTIVE LINEADS



No. 2105.

No. 2105. Perspective Linead or Centrolinead, mahogany, ebony lined, nickel-plated, swivels, with two studs, blade 24 in., arms 10 in., ... Each, $3 00

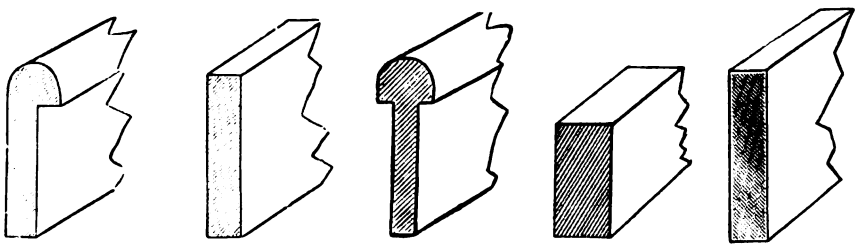
2106. Same as No. 2105, with blade 30 in., arms 11 in., . " 3 50

2107. Same as No. 2105, with blade 36 in., arms 12 in., . " 4 00

General Directions for Using Nos. 2105–2107. — Both edges of the blade are used for drafting. Above cut shows position in drawing from the left. To draw from the right it is only necessary to move the upper arm with the swivel to the lower end of the blade head. Complete directions with each instrument.

BARS FOR BEAM COMPASSES

No. 2119.



Style No. 1. No. 2. No. 3. No. 4. (For No. 783) No. 5. (For No. 1280)

Bars for Beam Compasses, made of hardwood.

No. 2119. Style No. 1, 2, 3, 4 or 5.

Size, . .	24	30	36	42	48	60 in.
Each, . .	$0 25	30	35	40	50	65

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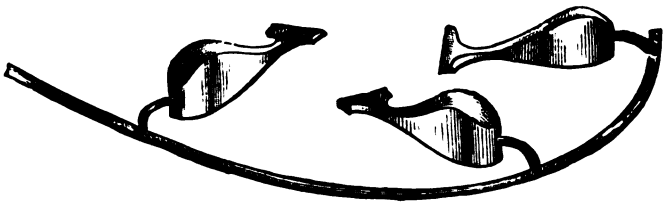
SPLINES

No. 2126.

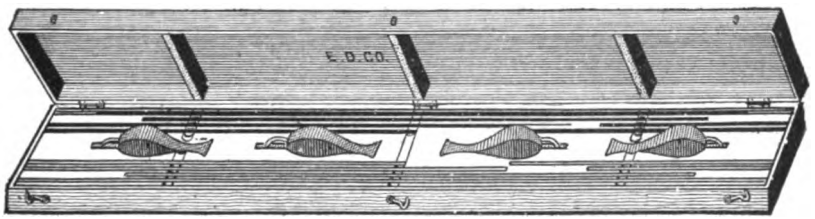
		Size,	24	30	36	42	48	60 in.
No. 2125.	Pearwood Splines, . .	Each, $0	15	20	25	30	35	45
2126.	Black Ambro Splines,	"	25	35	40	45	50	
2127.	Transparent Ambro Splines,	"	40	45	50	55	60	

WEIGHTS FOR SPLINES



No. 2130.

No. 2130. Weights for Splines, with finger, about 3½ lbs., . . Each, $0 85
2131. " " " " " " 5 " . . " 1 00



No. 2135.

No. 2135. Set of Splines and Spline Weights, containing:
4 Spline Weights, No. 2130.
1 each Pearwood Splines, No. 2125–12, 18, 24, 30, 36, 48 in.
1 " Black Ambro Splines, " 2126–12, 18, 24, 30, 36, 42 "
In strong wooden box, ... Per set, $10 00

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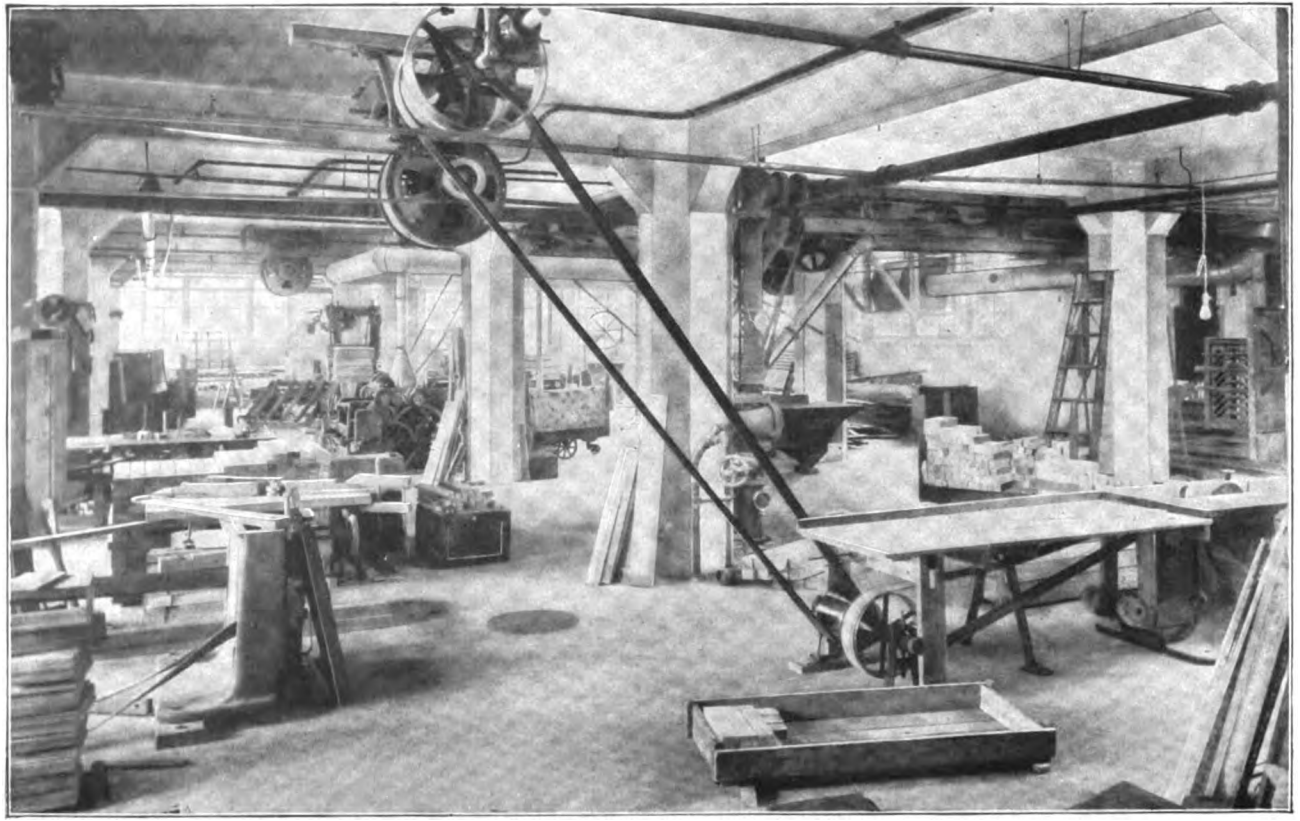

WOODWORKING DEPARTMENT—FACTORY

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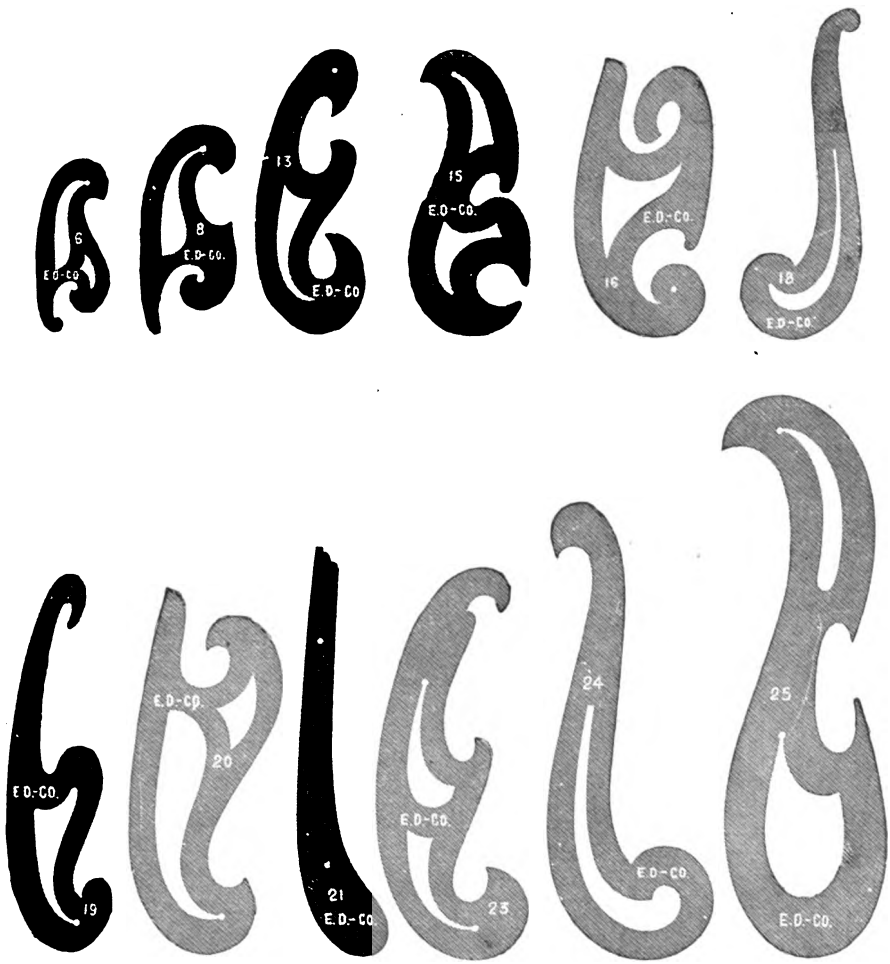
IRREGULAR WOODEN CURVES

Illustrations ⅛ to ⅙ size.



No. 2150.

No. 2150. Pearwood Curves.

Nos.	6	8	13	15	16	18
Each,	$0 15	20	25	25	25	25
Nos.	19	20	21	23	24	25
Each,	$0 30	30	25	35	35	40

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BLACK AMBRO CURVES

Illustrations ⅕ to ⅛ size.

No. 2151.

No. 2151. Black Ambro Curves.

Nos.	1	2	3	4	5	6	7	8	9	10	11
Each,	$0 30	30	30	30	30	30	30	35	30	30	30
Nos.	13	15	16	17	18	19	20	21	23	24	25
Each,	$0 40	40	45	45	40	50	55	40	65	65	1 00

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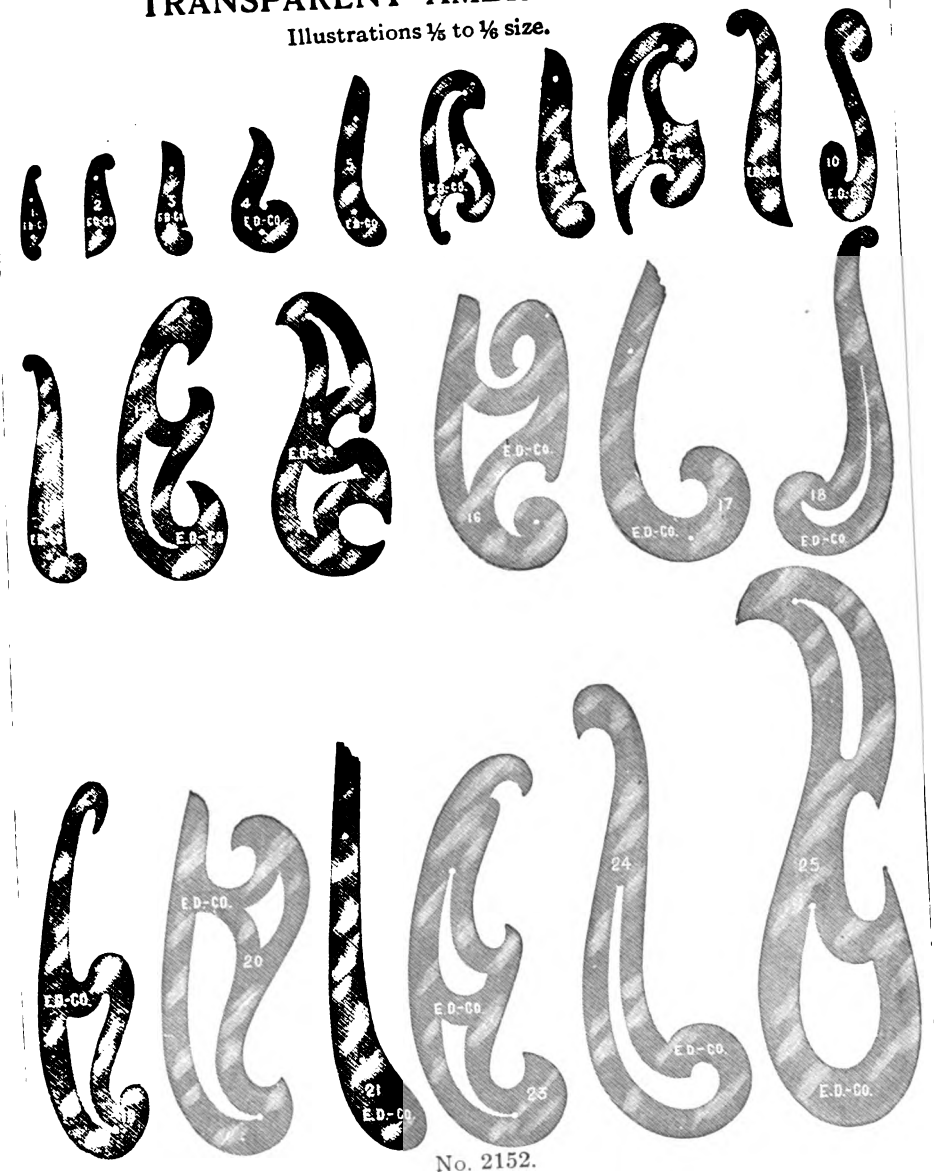
TRANSPARENT AMBRO CURVES

Illustrations ⅛ to ⅙ size.



No. 2152.

No. 2152. Transparent Ambro Curves.

Nos.	1	2	3	4	5	6	7	8	9	10	11
Each,	$0 35	35	35	40	40	45	45	50	50	50	50
Nos.	13	15	16	17	18	19	20	21	23	24	25
Each,	$0 60	60	60	60	60	75	90	60	90	90	1 50

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TRANSPARENT AMBRO CURVES

Continued

No. 2154–27. 2154–30. 2156.

No. 2153-27.	Combination Curve of Black Ambro, ... Each,	$0 75
2154-27.	" " " Transparent Ambro, . . "	1 00
2154–30.	" " " " " . . "	1 80
2156.	Logarithmic Spiral Curve of " " . . "	1 75

No. 2156 is mathematically constructed and contains every curve, only limited by its size. If properly used according to very explicit directions furnished with each, the most difficult calculations can be made with it.

CURVES FOR MECHANICAL ENGINEERS

No. 2158.

No. 2158.	Transparent Ambro Curves for Mechanical and Civil Engineers. Per set of 10 Curves in polished wooden box, . .	$4 80
2159.	Same Curves, of Black Ambro, Per set, ...	3 75

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ADJUSTABLE CURVE RULERS

No. 2160.

No. 2160. Adjustable Curve Ruler, 14½ in. long, ... Each, $2 25

No. 2161.

No. 2161. Adjustable Curve Ruler, 30 in. long, ... Each, $3 30

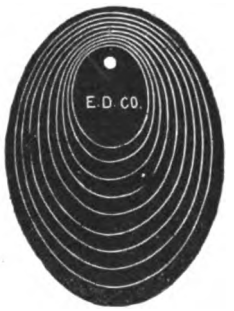
No. 2165.

No. 2165.	Adjustable Curve Ruler, Double Edge, 7 in. long, .	Each,	$0 42
2166.	" " " " " 15 " " .	"	87
2167.	" " " " " 31 " " .	"	1 70

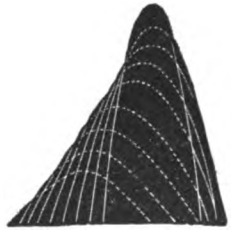
The above Rules can be instantly adjusted and retained to any form or curve. The working edge is made rounded, so that by slightly inclining the pencil two or more parallel curves can be drawn without moving the ruler.

ELLIPSES, HYPERBOLAS AND PARABOLAS

No. 2172.



2170.



2173.

			Per set.
No. 2170.	Hard Rubber Ellipses,	10 in set, from 1½ to 6 in., .	$2 50
2171.	" " "	6 " " " 2 " 4½ " .	1 50
2172.	Hard Rubber Hyperbolas,	8 " " " 2 " 5½ " .	2 25
2173.	Hard Rubber Parabolas,	8 " " " 1½ " 5½ " .	2 25
2174.	" " "	8 " " " 3½ " 14½ " .	5 00

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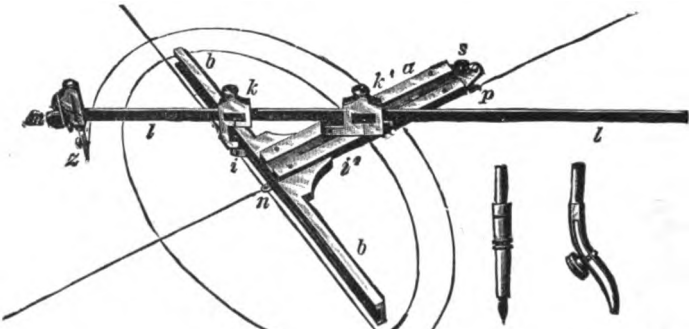
ELLIPSOGRAPH AND BEAM COMPASS COMBINED



No. 2195.

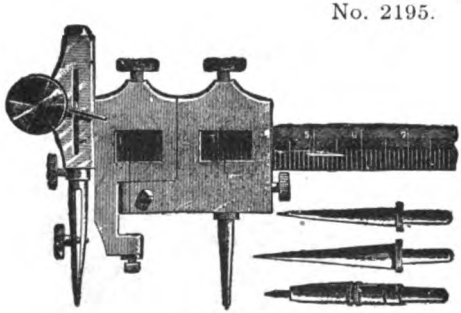


Fig. 1.

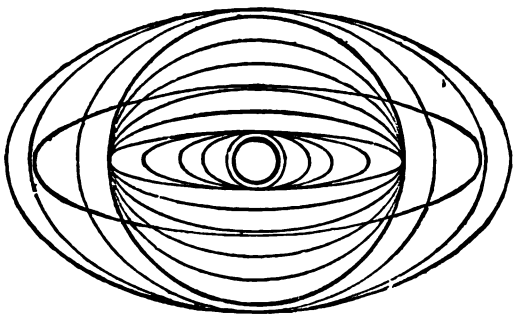


Fig. 2.

DESCRIPTION.

The apparatus consists of two main parts, the frame and the beam compass. The former forms a T with slots in both arms in which the clamps *i* and *ji* slide; these hold the beam *l-l* with pen or pencil *z*; it is divided and can be adjusted in the clamps and secured with the screws *k* and *k*; the frame can be separated in two parts *a* and *b* for keeping in a case.

For use, the frame is set and screwed together and the middle part at *n* set in the center of the intended ellipse, the front edge of the arm *b-b* to cover exactly the major axis; then secure in position by screwing down *s* till needle point of the same pierces the paper; adjust the beam *l* in clamp *i* to the length of minor axis and secure with screw *k*; then adjust beam in clamp *i* to the length of major axis, adding 20 mm. to the same, the axis of this clamp being so much nearer to the drawing point, and secure with screw *k*; set pen or pencil *z* to correct height by means of screw *m* and draw one-half of the ellipse; after this, lift drawing point *z*, release screw *p*, reverse the instrument by swinging it 180 degrees around point *n*, reset screw *p* and drawing point *z*, and draw other half.

The instrument permits to draw all kinds of ellipses and circles, from 10 to 560 mm. major diameter: the pen with bent point to be used for ellipses of less than 22 mm. diameter.

Fig. 1 shows the Beam Compass alone. Fig. 2 shows some examples.

No. 2195. Ellipsograph and Beam Compass combined, complete, in case, Each, $25 00

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COPENHAGEN SHIP CURVES

Nos. 2202-2204.

No. 2202.	Of **Wood,** per set of above 45 Curves, in case, . .	Each,	$16	50
2203.	Of **Hard Rubber,** per set of above 45 Curves, in case,	"	27	50
2204.	Of **Transparent Ambro,** per set of above 45 Curves, in case	"	31	50

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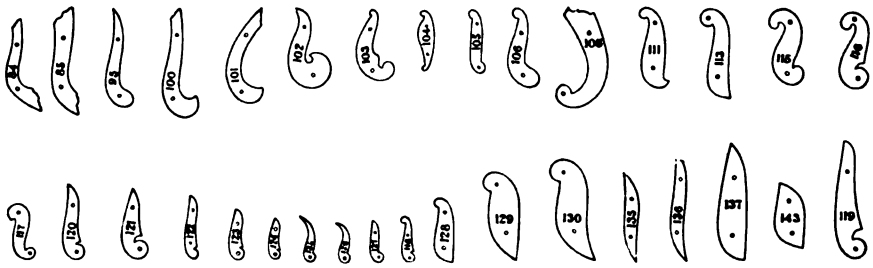
COPENHAGEN SHIP CURVES *Continued*

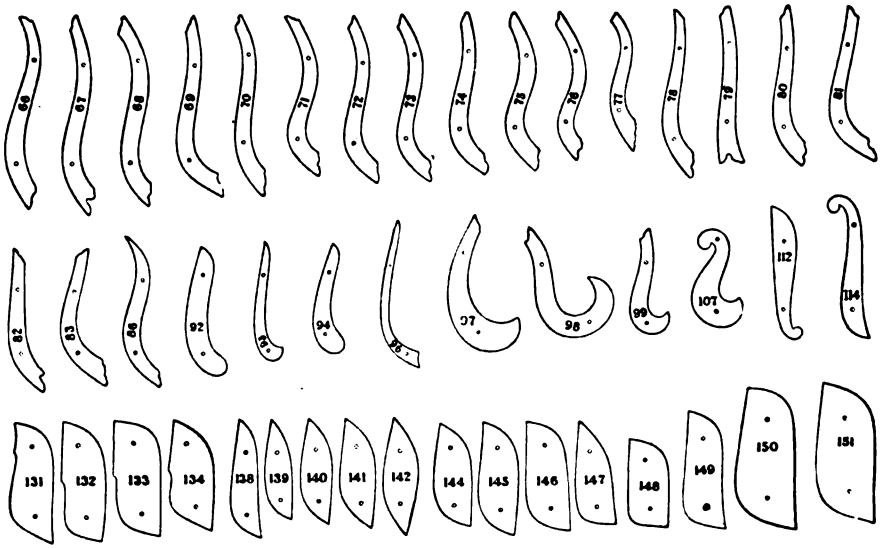
OF TRANSPARENT AND BLACK AMBRO

(Single Curves).

Illustrations ⅛ size.



No. 2210A. Of **Black Ambro,** single Curves, as shown above, . Each, $0 25
2210B. Of **Transparent Ambro,** single Curves, as shown above, " 35



No. 2212A. Of **Black Ambro,** single Curves, as shown above, . Each, $0 35
2212B. Of **Transparent Ambro,** single Curves, as shown above, " 45

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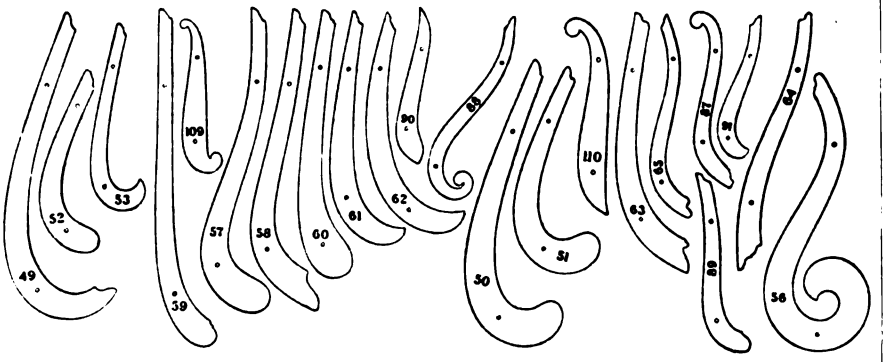
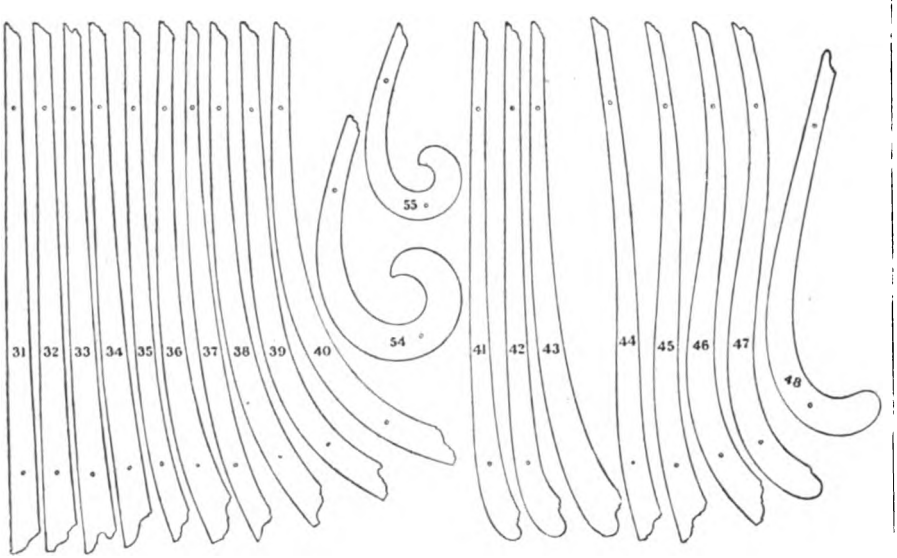
COPENHAGEN SHIP CURVES *Continued*

(Single Curves). Illustrations ⅛ size.



No. 2214A. Of **Black Ambro,** single Curves, as shown above, . Each, $0 50
2214B. Of **Transparent Ambro,** single Curves, as shown above, " 60



No. 2216A. Of **Black Ambro,** single Curves, as shown above, . Each, $ 0 95
2216B. Of **Transparent Ambro,** single Curves, as shown above, " 1 15
2218A. **Complete set, Black Ambro,** 121 Curves, as shown under Nos. 2210A, 2212A, 2214A and 2216A, in Hardwood Case, Per set, ... 54 50
2218B. **Complete set, Transparent Ambro,** 121 Curves, as shown under Nos. 2210B, 2212B, 2214B and 2216B, in Hardwood Case, Per set, ... 68 50

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RAILROAD CURVES

Of Wood and Card Board.

Nos. 2220–2224.

WOODEN RAILROAD CURVES.

No. 2220. Wooden Railroad Curves, 10 in set, 12 to 120 inches radius, viz.: 12, 24, 36, 48, 60, 72, 84, 96, 108, 120 in., in wooden box, Per set, **$ 3 50**

2222. Wooden Railroad Curves, 17 in set, 12 to 60 inches radius, viz.: 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60 in., in wooden box, ... Per set, **6 00**

2224. Wooden Railroad Curves, 44 in set, 3 to 200 inches radius, viz.: 3, 3½, 4, 4½, 5, 5½, 6, 6½, 7, 7½, 8, 8½, 9, 9½, 10, 12, 14, 16, 18, 20, 22, 24, 27, 30, 33, 36, 39, 42, 48, 54, 60, 66, 72, 78, 84, 90, 100, 110, 120, 130, 140, 160, 180, 200 inches, in wooden box, . Per set, **12 00**

CARD BOARD RAILROAD CURVES.

No. 2227. Card Board Railroad Curves, 30 in set, viz.: 1½, 2, 2½, 3, 3½, 4, 4½, 5, 5½, 6, 7, 8, 9, 10, 11, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 35, 40, 45, 50, 60 inches radius, in wooden box, ... Per set, **$ 5 25**

2228. Card Board Railroad Curves, 50 in set, viz.: 1½, 2, 2½, 3, 3½, 4, 4½, 5, 5½, 6, 6½, 7, 7½, 8, 8½, 9, 9½, 10, 10½, 11, 11½, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100, 110, 120 inches radius, in wooden box, . Per set, **8 50**

2229. Cardboard Railroad Curves, 100 in set, viz.: 1½, 2, 2½, 3, 3½, 4, 4½, 5, 5½, 6, 6½, 7, 7½, 8, 8½, 9, 9½, 10, 10½, 11, 11½, 12, 12½, 13, 13½, 14, 14½, 15, 15½, 16, 16½, 17, 17½, 18, 18½, 19, 19½, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 70, 75, 80, 85, 90, 95, 100, 110, 120, 130, 140, 150, 160, 180, 200, 220, 240 inches radius, in wooden box, Per set, **14 50**

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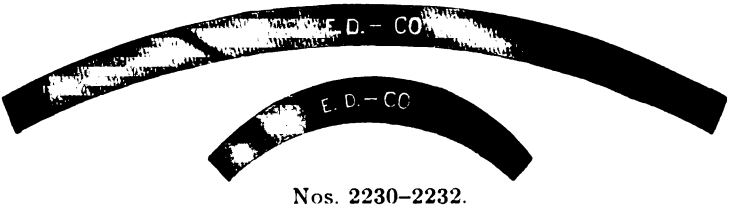
METAL RAILROAD CURVES.



Nos. 2230–2232.

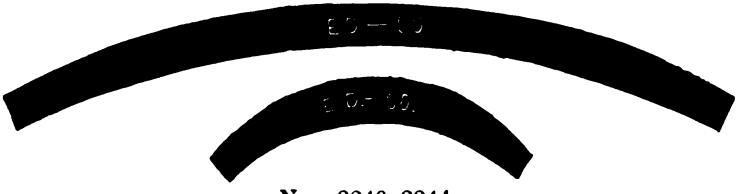
No. 2230. Metal Railroad Curves, 10 in set, 12 to 120 in. radius, viz.: 12, 24, 36, 48, 60, 72, 84, 96, 108, 120 in., in wooden box, Per set, ... $ 6 00

2232. Metal Railroad Curves, 17 in set, 12 to 60 in. radius, viz.: 12, 15, 18, 21, 24, 27, 30 33, 36, 39, 42, 45, 48, 51, 54, 57, 60 in., in wooden box,. . . . . Per set, 10 80

Single Railroad Curves of Metal, ... Each, 80

Any other sets containing up to 100 curves, furnished to order.

HARD RUBBER RAILROAD CURVES.



Nos. 2240–2244.

No. 2240. 10 Curves in set, 12 to 120 inches radius, viz.: 12, 24, 36, 48, 60, 72, 84, 96, 108, 120 inches, in wooden box, . . Per set, $6 50

2242. 17 Curves in set, 12 to 60 in. radius, viz.: 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60 in., in wooden box, ... Per set, 12 00

2244. 40 Curves in set, 3 to 120 in. radius, viz.: 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60, 66, 72, 78, 84, 90, 96, 102, 108, 114, 120 in. radius; 1 Curve 1° to 100 feet, Scale 57.30 in.; 1 Curve 2° to 100 feet, Scale 28.65 in., in wooden box with partition, Per set, 25 00

Single Railroad Curves of Hard Rubber, . . . Each, 80

Railroad Curves of any desired scale cut to order.

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RAILROAD CURVES *Continued*

Of Hard Rubber with Tangent.

No. 2248.

No. 2248. Hard Rubber Railroad Curves, ***with Tangent***, 41 in set, marked in degrees and inches to 100 feet scale, viz.:

0° 30′=114.59 in.	4° 15′=13.48 in.	7° 45′=7.40 in.
1° 00′= 57.30 "	4° 30′=12.73 "	8° 00′=7.17 "
1° 15′= 45.84 "	4° 45′=12.07 "	8° 15′=6.95 "
1° 30′= 38.20 "	5° 00′=11.46 "	8° 30′=6.75 "
1° 45′= 32.74 "	5° 15′=10.92 "	8° 45′=6.55 "
2° 00′= 28.65 "	5° 30′=10.42 "	9° 00′=6.37 "
2° 15′= 25.47 "	5° 45′= 9.97 "	9° 15′=6.20 "
2° 30′= 22.92 "	6° 00′= 9.55 "	9° 30′=6.04 "
2° 45′= 20.84 "	6° 15′= 9.17 "	9° 45′=5.88 "
3° 00′= 19.10 "	6° 30′= 8.82 "	10° 00′=5.74 "
3° 15′= 17.63 "	6° 45′= 8.49 "	10° 30′=5.48 "
3° 30′= 16.37 "	7° 00′= 8.19 "	11° 00′=5.22 "
3° 45′= 15.28 "	7° 15′= 7.91 "	11° 30′=4.99 "
4° 00′= 14.33 "	7° 30′= 7.64 "	

In wooden box with partition, ... Per set, $30 00

Railroad Curves of any desired scale cut to order.

Single Railroad Curves of Hard Rubber with Tangent, . . . Each, **$1 00**

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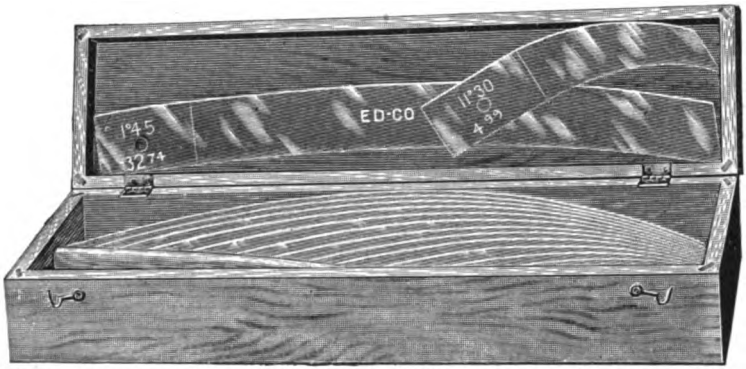
RAILROAD CURVES *Continued*

TRANSPARENT AMBRO RAILROAD CURVES.



No. 2256.

No. 2250. Transparent Ambro Railroad Curves, 10 in set, 12 to 120 in. radius, viz.: 12, 24, 36, 48, 60, 72, 84, 96, 108, 120 in., in wooden box, ... Per set, $ 9 50

No. 2252. Transparent Ambro Railroad Curves, 17 in set, 12 to 60 in. radius, viz.: 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60 in., in wooden box, ... Per set, 15 00

No. 2254. Transparent Ambro Railroad Curves, 30 in set, 1½ to 60 in. radius, viz.: 1½, 2, 2½, 3, 3½, 4, 4½, 5, 5½, 6, 7, 8, 9, 10, 11, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 35, 40, 45, 50, 60 in., in wooden box with partition, ... Per set, 26 00

No. 2256. Transparent Ambro Railroad Curves, **with Tangent,** 41 in set, marked in degrees and inches to 100 feet scale, viz.:

0°.30′ = 114.59 in.	3°.30′ = 16.37 in.	6°.00′ = 9.55 in.	8°.30′ = 6.75 in.
1°.00′ = 57.30 "	3°.45′ = 15.28 "	6°.15′ = 9.17 "	8°.45′ = 6.55 "
1°.15′ = 45.84 "	4°.00′ = 14.33 "	6°.30′ = 8.82 "	9°.00′ = 6.37 "
1°.30′ = 38.20 "	4°.15′ = 13.48 "	6°.45′ = 8.49 "	9°.15′ = 6.20 "
1°.45′ = 32.74 "	4°.30′ = 12.73 "	7°.00′ = 8.19 "	9°.30′ = 6.04 "
2°.00′ = 28.65 "	4°.45′ = 12.07 "	7°.15′ = 7.91 "	9°.45′ = 5.88 "
2°.15′ = 25.47 "	5°.00′ = 11.46 "	7°.30′ = 7.64 "	10°.00′ = 5.74 "
2°.30′ = 22.92 "	5°.15′ = 10.92 "	7°.45′ = 7.40 "	10°.30′ = 5.48 "
2°.45′ = 20.84 "	5°.30′ = 10.42 "	8°.00′ = 7.17 "	11°.00′ = 5.22 "
3°.00′ = 19.10 "	5°.45′ = 9.97 "	8°.15′ = 6.95 "	11°.30′ = 4.99 "
3°.15′ = 17.63 "	In wooden box with partition,		Per set, $40 00

No. 2258. Transparent Ambro Railroad Curves, **with Tangent,** 55 in set, marked in degrees and inches to 100 feet scale, viz.:

0°.15′ = 229.18 in.	3°.45′ = 15.28 in.	7°.15′ = 7.91 in.	11°.30′ = 4.99 in.
0°.30′ = 114.59 "	4°.00′ = 14.33 "	7°.30′ = 7.64 "	12°.00′ = 4.78 "
0°.45′ = 76.39 "	4°.15′ = 13.48 "	7°.45′ = 7.40 "	12°.30′ = 4.59 "
1°.00′ = 57.30 "	4°.30′ = 12.73 "	8°.00′ = 7.17 "	13°.00′ = 4.42 "
1°.15′ = 45.84 "	4°.45′ = 12.07 "	8°.15′ = 6.95 "	13°.30′ = 4.25 "
1°.30′ = 38.20 "	5°.00′ = 11.46 "	8°.30′ = 6.75 "	14°.00′ = 4.10 "
1°.45′ = 32.74 "	5°.15′ = 10.92 "	8°.45′ = 6.55 "	14°.30′ = 3.96 "
2°.00′ = 28.65 "	5°.30′ = 10.42 "	9°.00′ = 6.37 "	15°.00′ = 3.83 "
2°.15′ = 25.47 "	5°.45′ = 9.97 "	9°.15′ = 6.20 "	16°.00′ = 3.59 "
2°.30′ = 22.92 "	6°.00′ = 9.55 "	9°.30′ = 6.04 "	17°.00′ = 3.38 "
2°.45′ = 20.84 "	6°.15′ = 9.17 "	9°.45′ = 5.88 "	18°.00′ = 3.20 "
3°.00′ = 19.10 "	6°.30′ = 8.82 "	10°.00′ = 5.74 "	19°.00′ = 3.03 "
3°.15′ = 17.63 "	6°.45′ = 8.49 "	10°.30′ = 5.48 "	20°.00′ = 2.88 "
3°.30′ = 16.37 "	7°.00′ = 8.19 "	11°.00′ = 5.22 "	

In wooden box with partition, ... Per set, $52 00
Single Railroad Curves of Transparent Ambro, ... Each, 1 00
" " " " " " with Tangent, " 1 20

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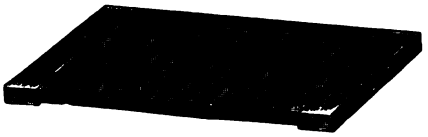
DRAWING BOARDS

Made with care, of selected narrow and thoroughly seasoned strips of Pinewood.

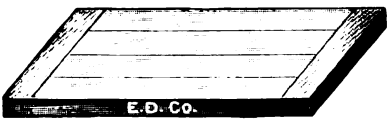
BEST WORKMANSHIP.



No. 2260.

No. 2260. Drawing Board, pinewood, with side ledges clamped.

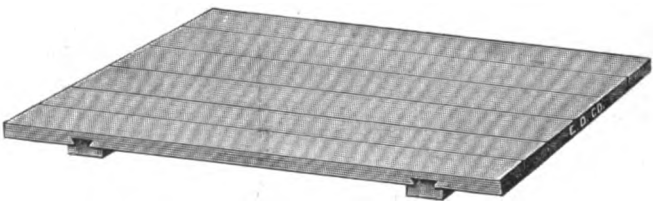
Size, . . .	12×17	16×22	20×24½	20×26	23×31 in.
Each, . . .	$0 65	95	1 15	1 25	1 75



No. 2265.

No. 2265. Drawing Board, pinewood, with two drawing surfaces and side ledges.

Size, .	12×17	16×22	20×24½	20×26	23×31	31×42 in.
Each, .	$0 65	95	1 15	1 25	1 75	3 50



No. 2272.

No. 2272. Drawing Board, pinewood, with hardwood ledges dovetailed into the board to allow contraction and expansion.

Size .	20×24½	23×31	31×42 in.
Each,	$2 00	2 80	4 25

Larger Drawing Boards of any size made to order.

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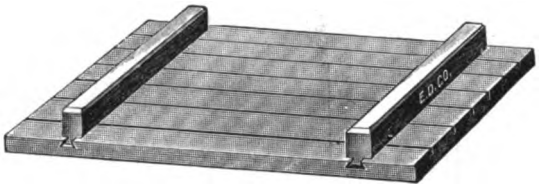
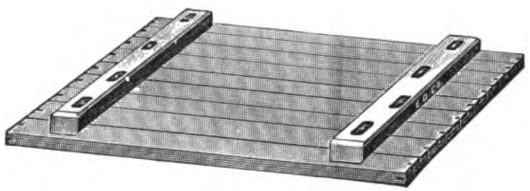


No. 2273.

No. 2273. Drawing Board, pinewood, with hardwood ledges dovetailed into the board to allow contraction and expansion, and grooves sunk in ¼ the thickness of the board, thus allowing the narrow wooden strips to be still more effectually controlled by the hardwood ledges.

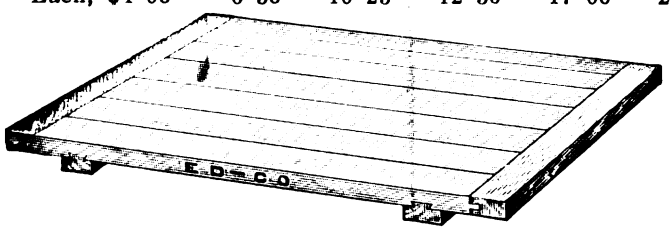
Size, . . .	31×42	36×55	42×60	48×72	48×84 in.
Each, . . .	$ 5 25	8 50	10 50	15 00	18 50



No. 2275.

No. 2275. Drawing Board, similar to No. 2273, but of **extra fine quality,** with screws passing through the ledges in oblong slots with metal bushings, which allow the screws to move when drawn by the contraction of the board. To make working edge perfectly smooth, a strip of hardwood is let into edge of board, allowing an easy movement of the T-square.

Size,	23×31	31×42	36×55	42×60	48×72	48×84 in.
Each,	$4 00	6 50	10 25	12 50	17 00	21 00



No. 2277.

No. 2277. Drawing Board, of narrow strips of best seasoned pinewood, with hardwood side ledges and dovetailed hardwood ledges underneath, to allow contraction and expansion. These Boards are used on our National Adjustable Drawing Tables Nos. 2312A–2314C, for which they are especially adapted.

Size, ...	31×42	36×55	42×60	48×72 in.
Distance between centers of bottom ledges, . .	26½	38½	50½	50½ in.
Each, ...	$6 25	9 50	11 50	18 00

Larger Drawing Boards of any size made to order.

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HORSES FOR DRAWING BOARDS

(Wooden)

No. 2290.

2291.

		Per pair.
No. 2289.	Wooden Horses, 37 in. high, 35 in long, light construction,	$3 25
2290.	" " 37 " " 38 " " fine quality, .	5 00
2291.	" " 37 " " 38 " " with sloping top ledges, fine quality, ...	5 50

No. 2293.

No. 2293. Adjustable Wooden Horses, adjustable for any slope, or can be used level. Height adjustments range from 37 to 47 inches. Length of Horses, 38 inches. Owing to the clamp which connects the fixed and movable parts, great rigidity at any height is assured. Of very solid construction, . Per pair, $7 00

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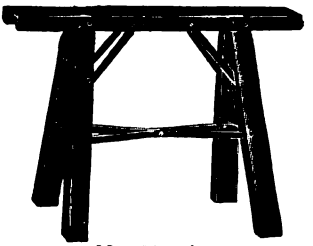
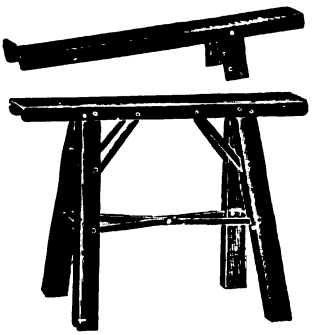
HORSES FOR DRAWING BOARDS *Continued*

(STEEL)



No. 2294A.



No. 2294B.

2294C.

These Horses are made entirely of steel, of modern design, and light but substantial construction. They are far more durable and of greater rigidity than horses made of wood. They possess the advantage over any other style in the fact that the plain horses can be changed into horses with either sloping or adjustable tops, these parts being sold separately at a nominal cost. The adjustable tops can be used level or adjusted for any slope; the height range is from 37 to 45 inches, without the clamping of any screws or intricate adjustments.

To reduce transportation and crating charges the horses are shipped "knocked down." Directions for assembling, and screw driver (only tool necessary) are furnished with each pair. The assembling is very simple.

		Per pair.
No. 2294A.	Steel Horses, 37 in. high, 38 in. long, plain, ...	$5 00
2294B.	Steel Horses, like No. 2294A, but with Sloping Tops No. 2294H, ...	7 75
2294C.	Steel Horses, like No. 2294A, but with Adjustable Tops No. 2294L, ...	9 25
2294H.	Sloping Tops, 38 in. long, ...	2 75
2294L.	Adjustable Tops, 38 in. long, ...	4 25

Above Horses are shipped "knocked down," with screw driver and directions for assembling.

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DRAWING STANDS AND TABLES

ECONOMY FOLDING STAND.

No. 2295.

The Economy Folding Stands are of simple but firm construction, with great range of adjustment. The adjustment is from 31 to 41 inches for height and from horizontal to 45 degrees for slant of board. When folded, these Stands occupy but very little space. The Drawing Boards on these Stands are of our regular stock, No. 2272, but having special hardwood ledges.

No. 2295. Economy Folding Stand, with Drawing Board 31×42 in., Each, ... $ 8 50

2296. Economy Folding Stand, with Drawing Board, 36×55 in., Each, ... 11 00

2297. Economy Folding Stand, of Hardwood, with Drawing Board, 31×42 in., Each, ... 10 50

2297½. Economy Folding Stand, of Hardwood, with Drawing Board, 36×55 in., Each, ... 13 50

For Parallel Rulers for Drawing Tables see Nos. 2102-2104.

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SHAMROCK ADJUSTABLE DRAWING TABLES

No. 2298A.

The "Shamrock" Drawing Tables are of simple but very substantial construction. The Stand is made of hardwood and the Drawing Board of well seasoned pinewood. Height adjustments from 32 to 42 inches are made by spreading or closing the legs, and the adjustment is held by a pin inserted in holes provided in a cam shaped piece. The Board may be tilted and rigidly clamped at any angle. Folds up compactly and occupies a comparatively small space when put away. Each Table furnished with drawer, lock and key.

No. 2298A.	Shamrock Drawing Table, board 36×48 in., . .	Each,	$16 00
2298B.	" " " " 42×60 " . .	"	19 00
2298C.	" " " " 48×66 " . .	"	22 00
2298D.	" " " " 48×72 " . .	"	24 00

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EUREKA ADJUSTABLE DRAWING TABLES

No. 2299A.

Made in three sizes and of very simple and durable construction. Board stands 40 inches above floor, and by means of simple device shown in illustration, can be tilted and securely clamped at any angle desired.

The box attached to trestle will be found very convenient for holding roll drawing papers, tracing cloth, etc. Each table is also furnished with adjustable tray.

No. 2299A.	Eureka Drawing Table, with Board 31 × 42 in., .	Each,	$15 00
2299B.	" " " " " 36 × 55 " .	"	19 00
2299C.	" " " " " 42 × 60 " .	"	22 00

For Parallel Rulers for Drawing Tables see Nos. 2102-2104.

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UNION FOLDING STAND

No. 2300A.

This Stand is substantially made and nicely finished, with adjustable iron chains to set to convenient height, and hinged top board to set the drawing board slanting.

It is very convenient for offices with limited room, since it can be easily folded up and put against the wall.

No. 2300A.	Union Folding Stand, of hardwood, size, as generally adjusted, 38 in. high, 30 in. long, 27 in. wide, . Each,	$6 50
2300B.	Large Union Folding Stand, of hardwood, size, as generally adjusted, 39 in. high, 47½ in. long, 35 in. wide, Each,	8 75
2301A	Union Folding Stand No. 2300A with grooved Drawing Board No. 2273, 31×42 inches, ... Each,	11 75
2301B.	Union Folding Stand No. 2300A, with grooved Drawing Board No. 2273, 36×55 inches, ... Each,	15 00
2301C.	Large Union Folding Stand, No. 2300B, with grooved Drawing Board No. 2273, 42×60 inches, . . . Each,	19 25
2301D.	Large Union Folding Stand No. 2300B, with grooved Drawing Board No. 2273, 48×72 inches, . . . Each,	23 75

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PEERLESS ADJUSTABLE FOLDING STAND

No. 2305A. Peerless Adjustable Folding Stand. Substantially made of hardwood, nicely finished, with stationary drawer, and is easily adjusted to convenient sitting or standing height. The board can be adjusted to any angle, as shown by the illustrations. The stand is 38 inches wide, perfectly rigid and firm in any position, and durable. If folded up it occupies but very little space.

Each, ... **$13 50**

No. 2305B. Stand No. 2305A, including Drawing Board No. 2265, 31×42 in.

Each, ... **$17 00**

No. 2305C. Stand No. 2305A, including Drawing Board No. 2273, 36×55 in.

Each, ... **$22 00**

No. 2305D. Stand No. 2305A, including Drawing Board No. 2273, 42×60 in.

Each, ... **$24 00**

No. 2305A.

Illustrated in three different positions.

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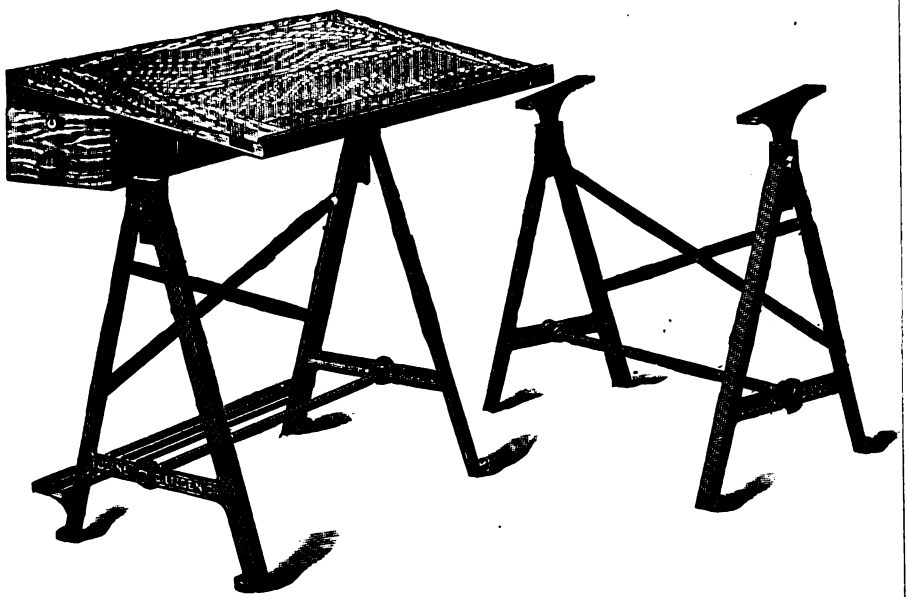
MADISON DRAWING TABLES



No. 2307B. 2307C.

The Madison Drawing Tables were designed to meet all the requirements of an efficient and durable Table for the class room. They are of solid iron construction, with hardwood top, neatly finished, and are so arranged that two students may alternately use one table, being provided with two drawers with locks for storing tools, two hooks for hanging T squares and have a shelf in back for holding the Drawing Boards. They have foot rest and sufficient knee room when the draftsman is sitting on a stool.

The hardwood top is permanently fixed at a convenient slant, but is adjustable to heights of 37, 39 and 41 inches by means of strong bolts which insure perfect rigidity at any height.

No. 2307A.	Madison Drawing Table, hardwood top 25×32 in., two drawers with locks, shelf and one pinewood Drawing Board No. 2265, 23×31 in., ...	Each,	$14 50
No. 2307B.	Madison Drawing Table, like No. 2307A, but without Drawing Board, ...	Each,	12 75
No. 2307C.	Madison Drawing Table, plain, without hardwood top, etc., ...	Each,	9 00

The Plain Table No. 2307C can be utilized to advantage with Drawing Boards from 23×31 in. to 36×48 in. in size.

Other styles of mechanical drawing tables for schools are made to order by us, where specifications are furnished.

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DRAFTSMEN'S STOOLS

No. 2307D. 2307F. 2307K.

No. 2307D.	Draftsman's Stool, golden elm, wood seat, height 34 in.,	Each,	$1 65
2307E.	Draftsman's Stool, like No. 2307D, but cane seat, .	"	1 85
2307F.	Draftsman's Stool, golden elm, wood seat, height adjustable from 31 to 35 in., ...	Each,	4 50
2307G.	Draftsman's Stool, like No. 2307F, but cane seat,	"	4 50
2307K.	" " oak, wood seat, height adjustable from 31 to 35 in., ...	Each,	5 25
2307L.	Draftsman's Stool, like No. 2307K, but cane seat, .	"	5 25

DUSTING BRUSHES

For removing crumbs of rubber, etc., from drawings.

No. 2307P.

No. 2307P.	Dusting Brush, invisible wire drawn, 8 in. brush with 6 in. handle, ...	Each,	$0 65
2307R.	Dusting Brush, all bristle, set in pitch, 8 in. brush with 6 in. handle, ...	Each,	80

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COLUMBIA ADJUSTABLE DRAWING TABLES

No. 2308K-R-T.

The Columbia Drawing Tables are made of cast iron, of rigid and durable construction and nicely japanned. The top is raised and lowered by rack and pinion, and can be tilted and clamped at any angle desired. The top consists of our regular pinewood drawing board, No. 2273, having hardwood ledges dovetailed into the board to allow for expansion or contraction.

No. 2308H.	Columbia Drawing Table, with Drawing Board 31×42 in., Each,	$31 50
2308J.	Columbia Drawing Table, with Drawing Board 36×55 in., Each,	35 00
2308K.	Columbia Drawing Table, with Drawing Board 42×60 in., Each,	38 50
2308L.	Columbia Drawing Table, with Drawing Board 48×72 in., Each,	44 50

ACCESSORIES.

No. 2308P.	Hardwood Footrest,	Each,	$1 65
2308R.	Folding-Arm with plain shelf,	"	2 50
2308S.	" " " large " and drawer with lock,	"	4 50
2308T.	Bracket with cabinet having two drawers with locks,	"	5 50

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NATIONAL ADJUSTABLE DRAWING TABLES

No. 2312C.

The National Drawing Tables are made of cast iron, substantially constructed, neatly finished and easily adjusted. The top consists of our regular pinewood drawing board, No. 2277, with dove-tailed hardwood ledges underneath and hardwood side ledges. The top can be clamped at any angle and is raised and lowered by rack and pinion.

No. 2312A.	National Adjustable Drawing Table, Stand No. 2314A, with Drawing Board, No. 2277, 31×42 in.,	Each,	$28 25
2312B.	National Adjustable Drawing Table, Stand No. 2314B, with Drawing Board, No. 2277, 36×55 in.,	"	33 50
2312C.	National Adjustable Drawing Table, Stand No. 2314C, with Drawing Board, No. 2277, 42×60 in.,	"	37 50
2312D.	National Adjustable Drawing Table, Stand No. 2314C, with Drawing Board, No. 2277, 48×72 in.,	"	44 00
2314A.	National Adjustable Drawing Stand, (without Drawing Board) distance between centers of brackets 26½ in.,	"	22 00
2314B.	National Adjustable Drawing Stand, (without Drawing Board) distance between centers of brackets 38½ in.,	"	24 00
2314C.	National Adjustable Drawing Stand, (without Drawing Board) distance between centers of brackets 50½ in.,	"	26 00

For Parallel Rulers for Drawing Tables, see Nos. 2102-2104.

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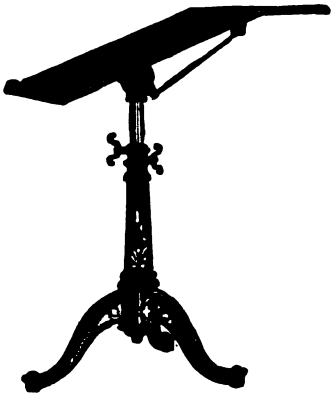
STANDARD DRAWING TABLES

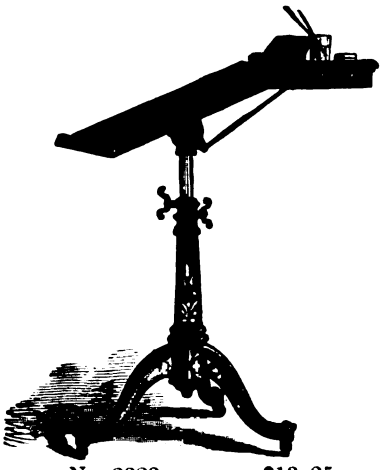
These Tables can be fixed at any *required height*, so one can use them either sitting or standing; and by turning back the screw at the right, it is allowed to rotate, bringing *either side in front*. The shelf or ledge for instruments is attached to the reverse side of the table, so that it is *always level*, whatever inclination is given to the desk. This is very convenient for the water-cups, inkstands, etc. When the table is nearly vertical the whole occupies but little space, and forms a perfect easel.

Cast iron is used for the tripod, hollow standard and sliding spindle, which are neatly painted and bronzed. The working parts are well finished and very easily operated. The stand is sufficiently firm to hold a large drawing board. They can be raised to a level of 44 inches and lowered to 30 inches.

No. 2320. . . $8 75



No. 2321. . . $10 00



No. 2323. . . $13 25

No. 2327. . . $11 00

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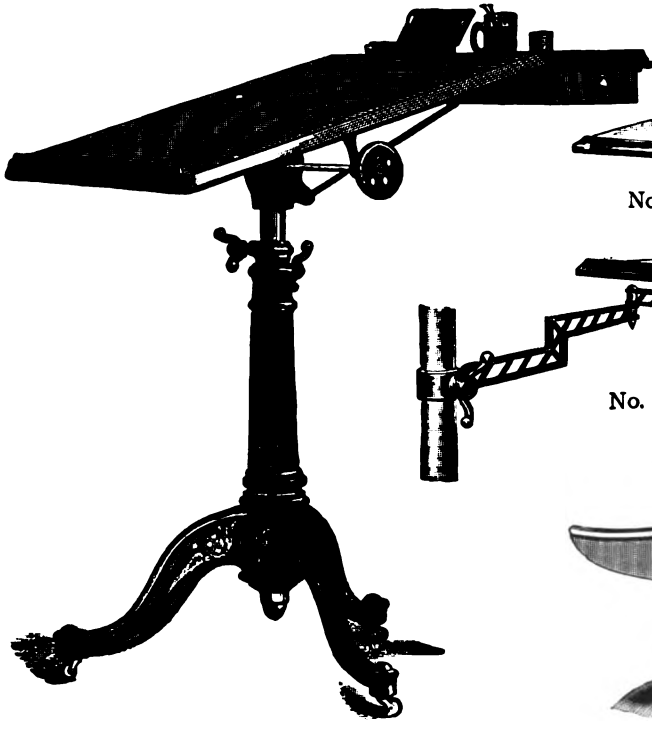
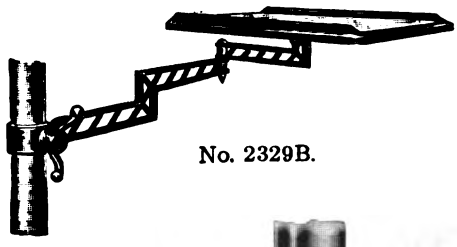
STANDARD DRAWING TABLES *Continued*

For Office, Library or Sitting Room.

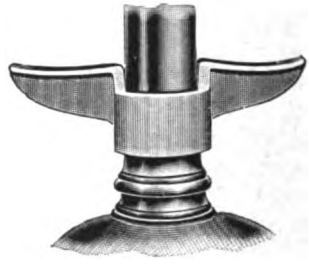


No. 2324.

No. 2329A.



No. 2329B.



No. 2329C.

No. 2320.	Ash Top, 22×24 in., ...	Each,	$ 8 75
2321.	" " 22×24 " with top shelf, . . .	"	10 00
2322.	Quar. Oak Top, 22×26 " " " " . . .	"	11 00
2323.	" " " 22×26 " top shelf with two drawers, on casters, ...	"	13 25
2323½.	Mahogany Top, otherwise same as No. 2323, . . .	"	14 00
2324.	Quartered Oak Top, 22×26 in., top shelf with two drawers, and long set screw, on casters, ...	"	14 50
2324½.	Mahogany Top, otherwise same as No. 2324, . . .	"	15 50
2327.	Clay Modeling Stand, Ash Top, 22×24 in., with cups,	"	11 00

ACCESSORIES

2329A.	Adjustable Shelf, plain, ...	Each,	$ 1 25
2329B.	Swinging Arm with Shelf, ...	"	1 75
2329C.	Foot Rest, ...	"	65
2329D.	Casters, to fit any of above Tables, ...	Per set,	30

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STANDARD DRAWING TABLES *Continued*

SPECIALLY ADAPTED FOR WATER-COLOR PAINTING

No. 2330.

No. 2330. Standard Drawing Table, Ash Top, 22 × 24 in., swinging-arm with large shelf, drawer with lock, and two holders for water-glasses, ... Each, $13 50

2332. Standard Drawing Table, Oak Top, 22×26 in., swinging-arm with shelf, drawer with lock, and two holders for water-glasses, ... Each, 14 50

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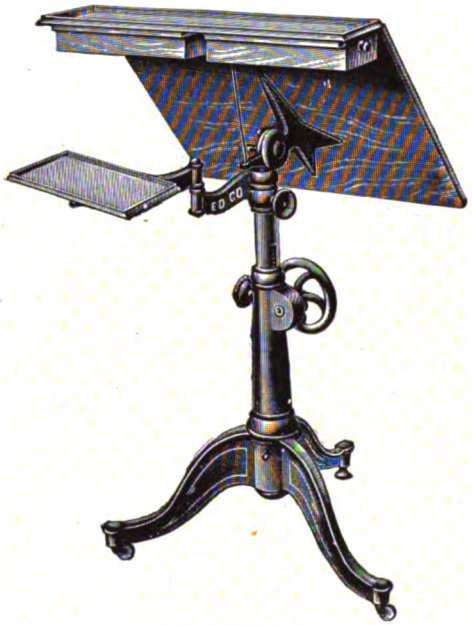
MATCHLESS DRAWING TABLES

With Rack and Pinion Movement.



No. 2345H-K.

These Tables are made of cast iron, with the exception of the top, of rigid and durable construction, and nicely finished. The top is easily raised and lowered by rack and pinion and can be tilted to any required angle.

No. 2345A.	Matchless Drawing Table, Oak Top, 22×24 in., plain, Each,	$13 50
2345B.	Matchless Drawing Table, Oak Top, 22×24 in., with shelf, Each,	15 75
2345F.	Matchless Drawing Table, Oak Top, 22×26 in., plain, Each,	14 00
2345G.	Matchless Drawing Table, Oak Top, 22×26 in., with shelf, Each,	16 25
2345H.	Matchless Drawing Table, Oak Top, 22×26 in., with shelf and two drawers, Each,	17 25

ACCESSORIES.

No. 2345K.	Folding-Arm, with plain shelf, Each,	$1 75
2345L.	" " " large " and drawer with lock (as shown in illustration No. 2330), Each,	4 50

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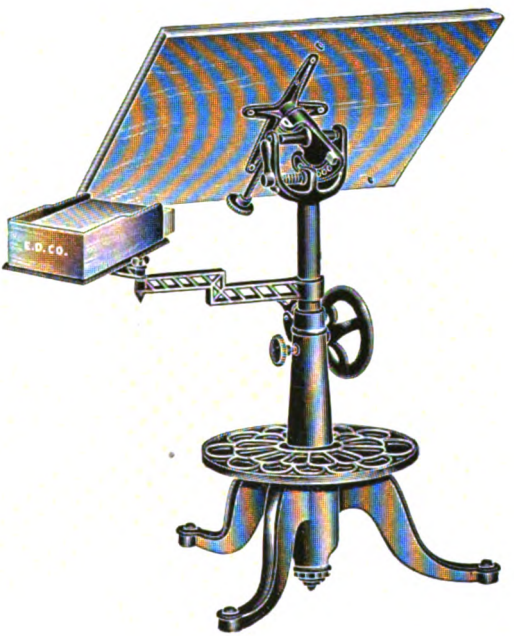
ARGUS DRAWING TABLES

With Rack and Pinion Movement.



No. 2346B.

These Tables consist of a cast iron stand, with circular iron foot rest, and oak top. They are nicely finished and of rigid and durable construction. The top can be easily raised or lowered by a rack and pinion movement; is adjustable to any angle and can be firmly clamped.

No. 2346A. Argus Drawing Table, Oak Top, 24 × 26 in., plain, Each, $12 50

2346B. Argus Drawing Table, Oak Top, 24 × 26 in., with folding arm, drawer and shelf, ... Each, 14 50

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MULTUM DRAWING TABLE

No. 2347B.

The Multum Tables are rigid, easily adjusted, substantially constructed and neatly finished. They are adjustable to heights of from 30 to 46 inches. The board can be tilted to any angle and revolved to any position. The removable tripod feature permits of using several boards (to which extra tripods have been attached) on one stand. When changing from one drawing to another, the board is lifted from the stand and replaced by another.

No. 2347A.	Multum Drawing Table, with Board No. 2272, 20 × 24½ inches, ...	Each,	$7 50
2347B.	Multum Drawing Table, with Board No. 2272, 23 × 31 inches, ...	Each,	8 30
2347C.	Multum Stand (without Board), ...	"	5 50
2347D.	Extra Tripods, ...	"	1 25

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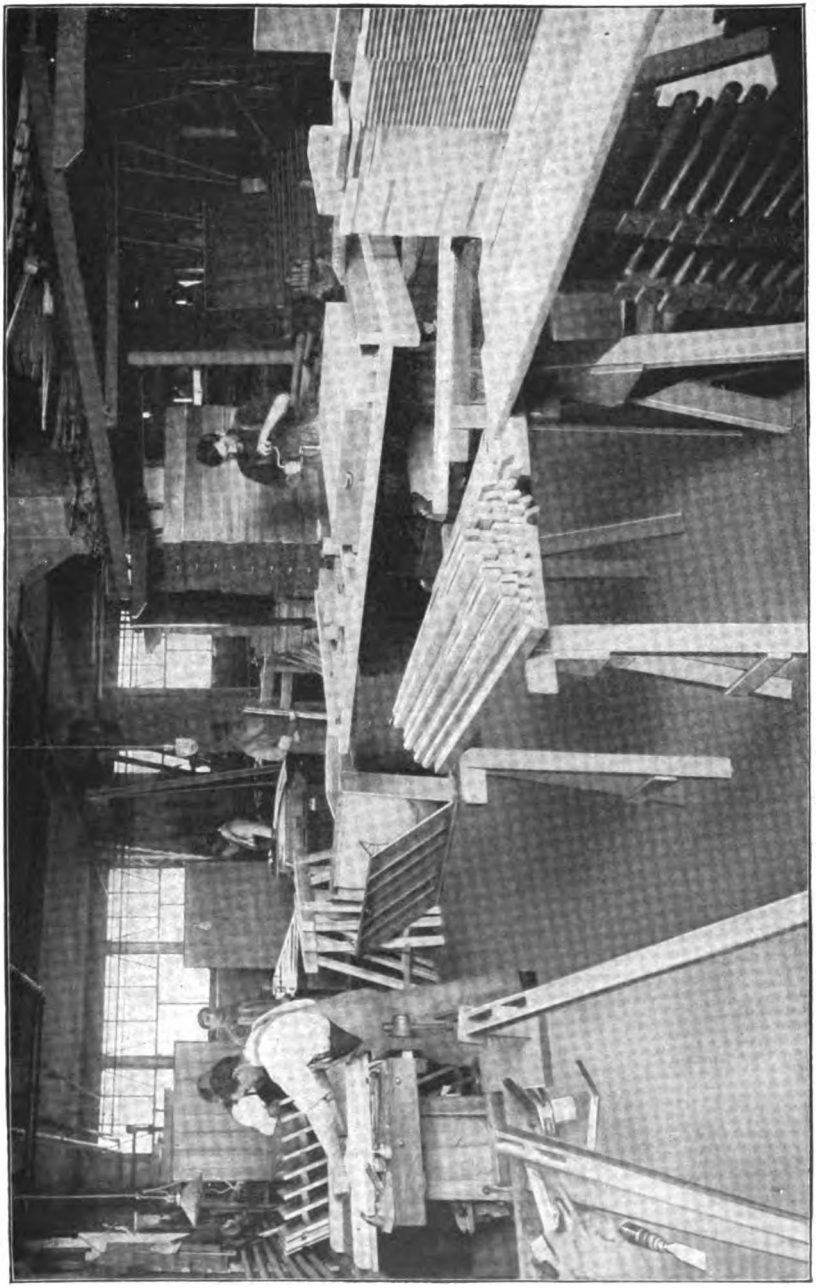

SECTION OF CABINET SHOP — FACTORY.

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SECTIONAL FILING CASES

For Filing Drawings Flat.

Showing three Sections No. 2348A, Top No. 2348K and Base with drawer, No. 2348R.

Our Cabinets are made on the plan of the well-known sectional book-cases. They will be found uniform in size, and always the same, so that any number of sections procured at different times will fit perfectly.

Sections—The Sections are made in three styles, as follows:

	OUTSIDE DIMENSIONS OF SECTION.			INSIDE DIMENSIONS OF DRAWERS.		
	Length.	Width.	Height.	Length.	Width.	Depth.
Section of 5 drawers,	45½ in.	34½ in.	14½ in.	42½ in.	32 in.	2 in.
Section " 3 "	45½ "	34½ "	14½ "	42½ "	32 "	3⅝ "
Section " 1 "	45½ "	34½ "	8 "	42½ "	32 "	6 "

The Drawers slide in grooves, there being no rails between them, and all joints are dove-tailed. The back of each drawer is covered for a space of 6 inches with a thin strip to prevent drawings from curling up. The joints are well glued, and glue blocks are used at frequent intervals, making the cases firm and durable.

Top—The Top is made in one style only, is closed at top and fits any Section; 45½ in. long, 34½ in. wide, 3 in. high.

Bases—The Bases are made in four styles, fitting any Section, as follows:

	OUTSIDE DIMENSIONS.		
Base, plain, ...	45½ in. long,	34½ in. wide,	4 in. high.
" with drawer 5¼ in. deep,	45½ " "	34½ " "	9½ " "
" low Sanitary, ...	45½ " "	34½ " "	5¾ " "
" high Sanitary, ...	45½ " "	34½ " "	22¾ " "

Material—The Sections, Top and Bases are made of well-seasoned and thoroughly kiln-dried oak.

Finish and Trimmings—Golden oak stain and filler; three coats of varnish, rubbed and finished in a uniform color; oxidized drawer pulls and label holders.

For illustrations and prices of Sections, Top and Bases, see next page.

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SECTIONAL FILING CASES *Continued*

SECTIONS

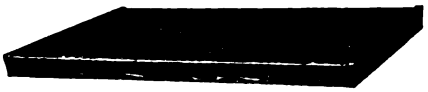
No. 2348A.

2348F.

No. 2348G.

		Each.
No. 2348A.	Section of 5 Drawers, height 14½ in., drawers 2 in. deep,	$22 50
2348F.	" " 3 " " 14½ " " 3⅝ " "	21 50
2348G.	" " 1 Drawer, " 8 " drawer 6 in. deep,	10 00

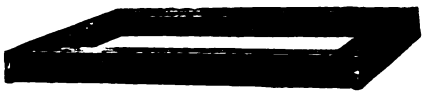
TOP



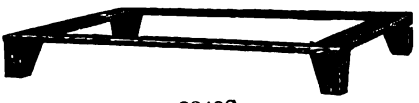
No. 2348K.

No. 2348K. Top, height 3 in., ... Each, $7 50

BASES



No. 2348P.



2348S.

No. 2348R.

2348T.

No. 2348P.	Base, plain, height 4 in., ...	Each, $ 5 00
2348R.	" with drawer, height 9½ in., drawer 5¼ in. deep,	" 11 00
2348S.	" low Sanitary, " 5¾ in., ...	" 5 00
2348T.	" high Sanitary, " 22¾ in., ...	" 9 75

For complete description of above, see preceding page.

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COMBINATION FILING CABINETS

No. 2349A.

This Combination Filing Cabinet is made of well-seasoned oak, golden oak rubbed finish, and is composed of two filing sections, No. 2348A, each containing 5 drawers, the inside measurements of which are 42½ × 32 × 2 inches; low Sanitary Base No. 2348S; and a swinging arm with tray and drawer. The top is a fine pinewood Drawing Board, with a sketch box 3 inches deep; the Board is so arranged that it can be extended from six to eight inches beyond the front edge of the cabinet, raised or lowered ten inches on the level, and tilted to any angle. The parts are securely fastened together, making a very rigid outfit.

No. 2349A.	Combination Filing Cabinet,	**adjustable top,**	37 × 54 in.,	Each,	**$73**	**00**
2349B.	"	"	"	"	"	37 × 60	"	"	**74**	**50**
2349C.	"	"	"	"	"	40 × 72	"	"	**78**	**50**
2349F.	"	"	"	**flat top,**		37 × 54	"	"	**66**	**75**
2349G.	"	"	"	"	"	37 × 60	"	"	**68**	**25**
2349H.	"	"	"	"	"	40 × 72	"	"	**72**	**25**

Nos. 2349F–2349H have a flat Drawing Board top, as shown in illustration below.

No. 2350A.

This Combination Filing Cabinet consists of one filing section, No. 2348A, containing 5 drawers, each 42½ × 32 × 2 inches, inside measurement; high Sanitary Base, No. 2348T; flat pinewood Drawing Board top, which is put on with slides so it can be drawn forward; and a swinging arm with tray and drawer. It is 38 inches in height, made of well-seasoned oak, golden oak rubbed finish, making a very neat, durable and practical outfit.

No. 2350A.	Combination Filing Cabinet,	flat top,	37 × 54 in.,	Each,	**$49**	**00**
2350B.	"	"	"	"	"	37 × 60	"	"	**50**	**50**
2350C.	"	"	"	"	"	40 × 72	"	"	**54**	**50**

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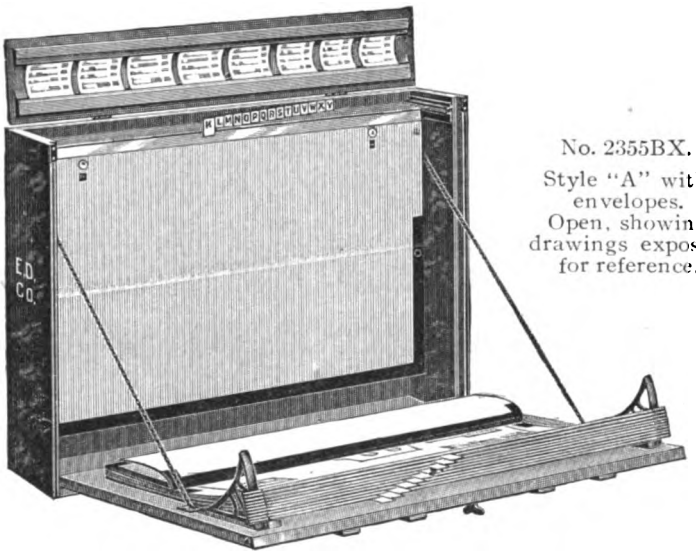
THE "BECK" VERTICAL FILING CASES

For Drawings, Tracings, Blue Prints, Maps, Charts and Specifications

The Beck Vertical Filing Case is a radical change from other methods of filing and indexing, and does entirely away with all of the annoying and time-wasting features of other filing systems. It is compact, simple to operate and is, without question, the most satisfactory and rapid arrangement for filing yet devised. Drawings or tracings may be extracted without disturbing the order of the balance, or they may be instantly exposed for reference without changing their position in the file.

These filing cases are manufactured by us of carefully selected and thoroughly seasoned material, while the workmanship and finish are of the highest order.

Patented in United States, Great Britain, Canada and Germany.



No. 2355BX.
Style "A" with envelopes.
Open, showing drawings exposed for reference.

The Beck Vertical Filing Case consists of a vertical case about 6 inches deep inside, having a hinged top and a drop front to form a desk, upon which the drawings are exposed for reference. Fastened to the sides of the case, near the top, are a pair of metal grooves, which receive the ends of the metal rods to which the envelopes or file sheets are securely fastened by means of strong metal holders. The top of the case is grooved to hold a series of cards for a classified index of the contents.

Each filing case includes 24 envelopes or 24 file sheets, as ordered, each bearing an index tab as shown in illustration. The envelopes are made of the best manilla tag board, bound at the edges with cloth, and are so constructed that the drawings or tracings are held perfectly flat in a vertical position, requiring no fastening whatever. The file sheets are also of the best manilla tag board and have a series of stub leaves at the top, to which the drawings or tracings are secured by ordinary paper fasteners.

We strongly recommend the use of the envelopes when the drawings or tracings are to be taken frequently from the case for reference, or to have reproductions made.

Our illustrated pamphlet containing full description and price list of the various styles of Beck Files sent to any address on request.

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"BECK" VERTICAL FILING CASES *Continued*

STYLE "A" WALL CASES

The capacity of each Style "A" wall case is about 480 sheets of drawings or tracings. All cases are of uniform depth, about 6 in. inside and about 7½ in. over all, outside. In width and height they are 5 in. larger than the drawing or tracing to be filed. A 24x36 in. filing case is 29 in. high and 41 in. wide, outside.

These cases should be securely fastened to the wall at a suitable height to form a desk when the drop front is down, or attached to Sanitary bases as illustrated and described under Nos. 2356A to 2356E. They can also be "built up" on the well-known plan of sectional bookcases, by using the "Unit" standards, as shown on next page.

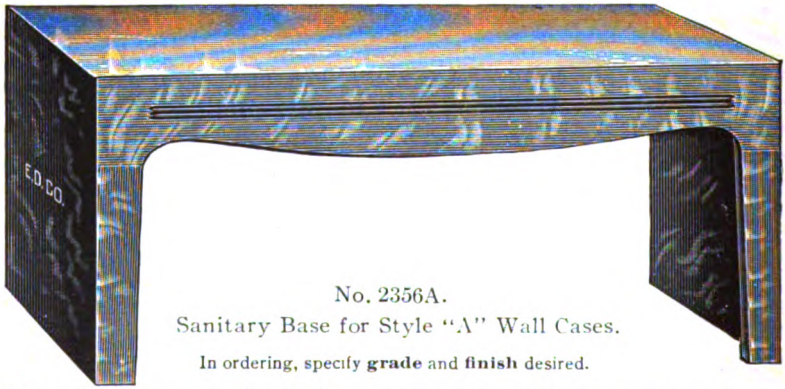
Made in three grades, as follows:

GRADE 1—Quarter-Sawed Oak, finished in Golden Oak, Antique or Natural as desired.
GRADE 2—Plain Oak, finished either dark or light, as desired.
GRADE 3—Black Ash, dark finish.
Cases of Mahogany, Birch or any other size or finish made to order.

		For Drawings		Each Grade 1	Each Grade 2	Each Grade 3
No. 2355A.	Style "A"	22×30 in.	with 24 file sheets,	$22 85	$21 45	$20 65
2355AX.	"	22×30 "	" 24 envelopes,	28 85	27 45	26 65
2355B.	"	24×36 "	" 24 file sheets,	23 95	22 55	21 45
2355BX.	"	24×36 "	" 24 envelopes,	29 95	28 55	27 45
2355C.	"	30×42 "	" 24 file sheets,	26 85	24 90	23 90
2355CX.	"	30×42 "	" 24 envelopes,	34 65	32 70	31 70
2355D.	"	36×42 "	" 24 file sheets,	27 65	26 40	24 65
2355DX.	"	36×42 "	" 24 envelopes,	35 45	34 20	32 45
2355E.	"	36×48 "	" 24 file sheets,	31 55	29 40	27 65
2355EX.	"	36×48 "	" 24 envelopes,	39 35	37 20	35 45

In ordering, specify **grade** and **finish** desired.

BASES FOR STYLE "A" WALL CASES



No. 2356A.
Sanitary Base for Style "A" Wall Cases.

In ordering, specify **grade** and **finish** desired.

These Bases are of the Sanitary type, substantially made, and can be fastened either to the wall or the floor, as desired. They are furnished in the same grades and finishes as the filing cases, to which they can be quickly and easily attached. Their height is based upon the size of the filing case to be used. The prices shown below include the necessary hardware for attaching the filing case to base, and the base to the wall or floor.

				Each Grade 1	Each Grade 2	Each Grade 3
No. 2356A.	Sanitary Base, height	26 in., for Case	22×30 in.,	$6 50	$6 30	$6 20
2356B.	" " "	26 " " "	24×36 "	6 70	6 40	6 30
2356C.	" " "	26 " " "	30×42 "	6 80	6 60	6 50
2356D.	" " "	22 " " "	36×42 "	6 80	6 60	6 50
2356E.	" " "	22 " " "	36×48 "	7 00	6 80	6 70

Our illustrated pamphlet containing full description and price list of the various styles of Beck Files sent to any address on request.

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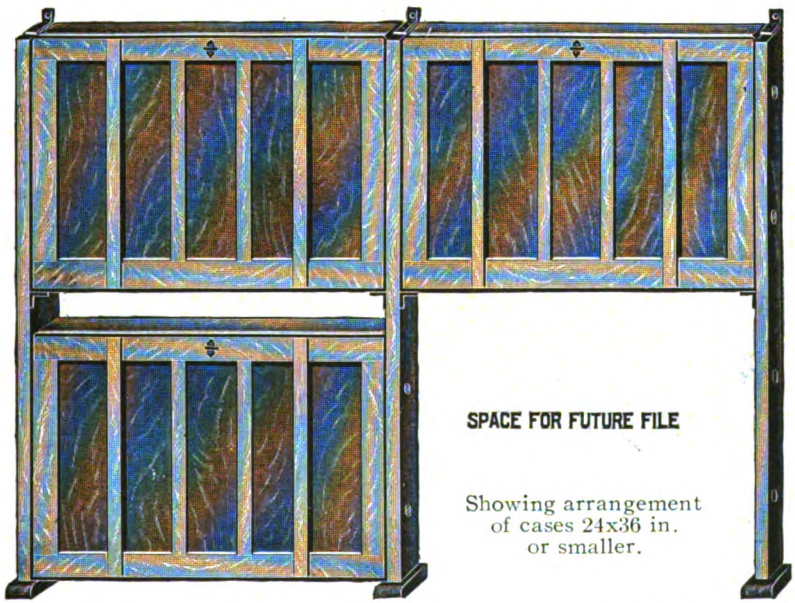
"BECK" VERTICAL FILING CASES *Continued*

"UNIT" STANDARDS FOR STYLE "A" WALL CASES

Each single file, while complete in itself, is also a unit of the entire system. It is therefore necessary to install only enough files for immediate use, adding a unit to the system from time to time as the drawings increase in number. To facilitate the adding of units we can furnish "Unit" Standards, by means of which two or more files can be joined in a very simple manner. They are easily attached to the wall and are furnished in the same grades and finishes as the filing cases. The prices shown below are for *single Standards; two* Standards being required for the first file and only *one* Standard for each additional file.

Cases for drawings or tracings 24×36 in. or smaller, are usually built up two in height, while cases for larger drawings or tracings are used one in height, placed at a covenient distance from the floor.



Showing arrangement of cases 24x36 in. or smaller.

		Height			Each Grade 1	Each Grade 2	Each Grade 3
No. 2359A.	"Unit" Standards,	66 in.,	for Cases	22×30 in.,	$3 60	$3 40	$3 20
2359B.	" "	69 "	" "	24×36 "	3 60	3 40	3 20

"Unit" Standards Nos. 2359C to E, as listed below, are for use with cases larger than 24×36 in., the cases being built up only *one* in height and placed at a convenient distance from the floor.

		Height			Each Grade 1	Each Grade 2	Each Grade 3
No. 2359C.	"Unit" Standards,	66 in.,	for Cases	30×42 in.,	$3 60	$3 40	$3 20
2359D.	" "	66 "	" "	36×42 "	3 60	3 40	3 20
2359E.	" "	66 "	" "	36×48 "	3 60	3 40	3 20

In ordering, specify **grade** and **finish** desired.

Our illustrated pamphlet containing full description and price list of the various styles of Beck Files sent to any address on request.

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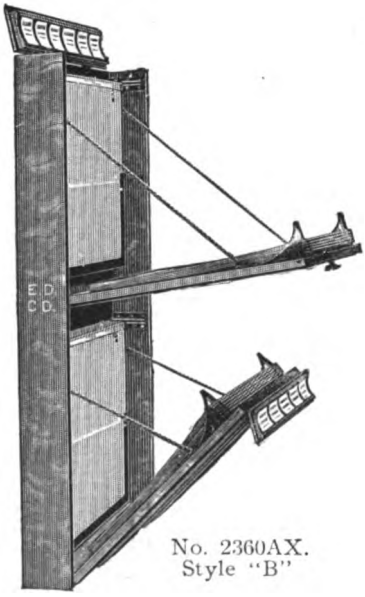
"BECK" VERTICAL FILING CASES *Continued*

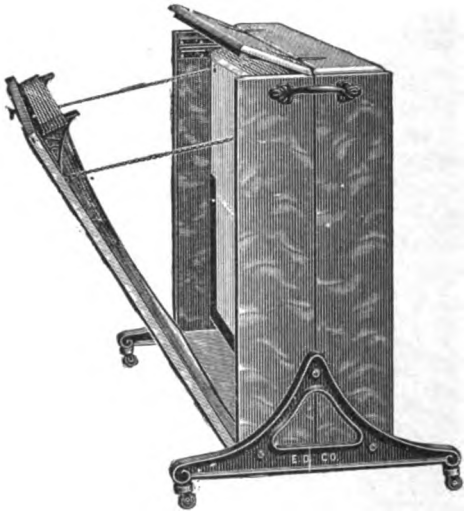
DOUBLE-DECK AND COMBINATION STYLES

The Double-deck or Style "B" filing cases have double the capacity of Style "A," or about 960 drawings or tracings, without requiring additional floor space. They are usually attached to the wall with the base resting on the floor, thus making both files easily accessible. These filing cases can also be installed in a vault or file room, by suspending them from I-beams by means of metal hangers with rollers, and prices for the equipment necessary for installing the files in this manner will be furnished upon application.

The Combination or Style "E" filing cases consist of two Style "A" filing cases securely fastened to each other, back to back, and rigidly attached to metal bases on rollers. These files can be easily moved from place to place in the office, and rolled into the vault for protection.



No. 2360AX.
Style "B"



No. 2361AX.
Style "E"

		For Drawings		Each Grade 1	Each Grade 2	Each Grade 3
No. 2360A.	Style "B"	22×30 in.,	with 48 file sheets,	$39 10	$36 90	$34 70
2360AX.	"	22×30 "	" 48 envelopes,	51 10	48 90	46 70
2360B.	"	24×36 "	" 48 file sheets,	41 30	39 10	36 90
2360BX.	"	24×36 "	" 48 envelopes,	53 30	51 10	48 90
2361A.	Style "E"	22×30 "	" 48 file sheets,	41 80	39 10	36 90
2361AX.	"	22×30 "	" 48 envelopes,	53 80	51 10	48 90
2361B.	"	24×36 "	" 48 file sheets,	44 60	41 30	39 10
2361BX.	"	24×36 "	" 48 envelopes,	56 60	53 30	51 10

In ordering, specify grade and finish desired.

EXTRA ENVELOPES AND FILE SHEETS

Envelopes, for drawings	22×30 or 24×36 in.,	Each,	$0 45
" " "	30×42 " 36×42 or 36×48 in.,	"	55
File Sheets, " "	22×30 " 24×36 in.,	Set of 24,	4 80
" " "	30×42 " 36×42 or 36×48 in.,	" "	5 40

Our illustrated pamphlet containing full description and price list of the various styles of Beck Files sent to any address on request.

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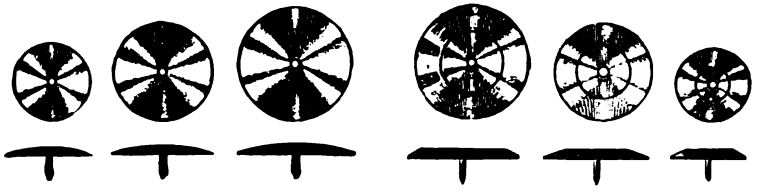
GEM UNION THUMB TACKS



No. 2362. 2364 2366. 2376. 2374. 2372.

Gem Union Thumb Tacks, Nos. 2362–2376, are made by hand, with great care. They have best hardened steel pins judiciously proportioned in thickness and length so as not to bend, which are screwed and riveted into German Silver heads, with fine, thin edges, offering no obstruction to T-square or Triangle to slide over.

Packed one dozen on a card

No. 2362.	German Silver, Round Heads, $\frac{3}{8}$ in. diameter, .	Per doz.,	$0 50
2364.	" " " " $\frac{1}{2}$ " "	"	65
2366.	" " " " $\frac{5}{8}$ " "	"	80
2372.	German Silver, Beveled Heads, $\frac{3}{8}$ " "	"	50
2374.	" " " " $\frac{1}{2}$ " "	"	65
2376.	" " " " $\frac{5}{8}$ " "	"	80

SOLID STEEL TACKS.

No. 2389.	Solid Blue Steel, Round Heads, $\frac{5}{16}$ in. diam., very fine, Per doz.,		$0 80
2390.	" " " " " $\frac{1}{2}$ " " " " "		1 00

THUMB TACKS WITH RIVETED STEEL POINTS

No. 2401. 2403. 2405. 2426. 2424. 2422.

Thumb Tacks Nos. 2401–2426 are inferior in quality to the above Gem Union Tacks and pins are not screwed in, but prevented from pushing through.

Packed one dozen on a card

		Per gross.	Per doz.
No. 2401.	German Silver, Round Heads, $\frac{3}{8}$ in. diameter, .	$2 00	$0 20
2403.	" " " " $\frac{1}{2}$ " " . . .	2 50	25
2405.	" " " " $\frac{5}{8}$ " " . . .	3 50	35
2422.	Brass, Round Heads, $\frac{3}{8}$ in. diameter, ...	1 50	15
2424.	" " " $\frac{1}{2}$ " "	2 00	20
2426.	" " " $\frac{5}{8}$ " "	3 00	30

No. 2430.

BRASS THUMB TACKS IN TIN BOXES.

No. 2430. Brass, Round Heads, $\frac{3}{8}$ in. diameter, one dozen in tin box,
Per box, ... $0 10

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SIMPLEX BRASS THUMB TACKS

In Boxes of one gross only

No. 2434. 2435. 2436.

No. 2434.	Brass Round Heads, $\frac{3}{16}$ in. diam., Per box of one gross, .	$1 00
2435.	" " " $\frac{1}{2}$ " " " " " .	1 30
2436.	" " " $\frac{5}{8}$ " " " " " .	1 60

STEEL STAMPED THUMB TACKS

No. 2440. 2441. 2442.

Our Steel Stamped Thumb Tacks are made of one piece of hard steel and are of the best quality. They have needle-finished points, and make an excellent substitute for the regular thumb tack when a lower-priced article is desired.

No. 2440.	Round Heads, $\frac{5}{16}$ in. diam., Per box of 100,	$0 45;	Doz., (loose),	$0 06
2440C.	" " $\frac{5}{16}$ " " " gross,	80;	" (on card),	07
2441.	" " $\frac{3}{8}$ " " " box of 100,	55;	" (loose),	08
2441C.	" " $\frac{3}{8}$ " " " gross,	1 00;	" (on card),	09
2442.	" " $\frac{1}{2}$ " " " box of 100,	70;	" (loose),	10
2442C.	" " $\frac{1}{2}$ " " " gross,	1 20;	" (on card),	11

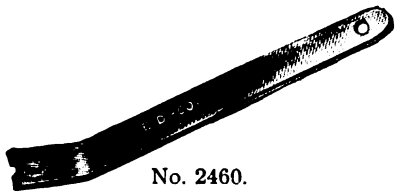
SOLID STEEL HEAD THUMB TACKS

No. 2445. 2446. 2447.

The Steel Head Thumb Tacks have a very thin and strong steel head, so constructed as to prevent the pin from pulling out or pushing through. They are of neat appearance and very durable.

No. 2445.	Round Heads, $\frac{5}{16}$ in. diam., Per box of 100,	$0 80;	Doz., (loose),	$0 12
2446.	" " $\frac{3}{8}$ " " " " "	1 00;	" "	15
2447.	" " $\frac{1}{2}$ " " " " "	1 20;	" "	18

TACK LIFTER



No. 2460.

Made of metal and plated. Is convenient for pushing in as well as extracting tacks from the drawing board, without injury to the points. The handle can be used as paper cutter, and is serviceable for pressing down the edges in stretching paper, and removing sheets which have been gummed to board.

No. 2460. Tack Lifter, nickel-plated, ... Each, $0 25

See also No. 3418, File and Tack Lifter.

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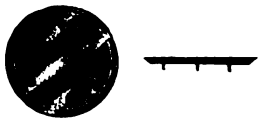
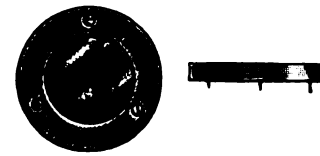
HORN CENTERS



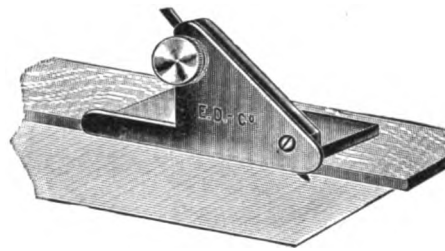
No. 2465.



2466.

No. 2465. Horn Center, plain, ½ in. diameter, ... Each, $0 10
2466. " " with German silver rim, ¾ in. diameter, " 50

PAPER CUTTERS



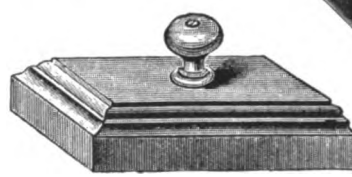
No. 2470.

No. 2470. Paper Cutter, brass, ... Each, $0 35
2471. " " nickel plated, ... " 40

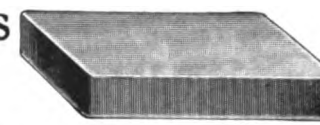
These instruments are used for cutting drawings from the board, also for cutting any kind of paper or bristol board. They can be slid along T-square or straight edge without injuring its edge, and have a thumb-screw adjustment which may be set so as to cut only the thickness of the paper, without marking the drawing board.

PAPER WEIGHTS

No. 2480.



No. 2482.



No. 2484.

No. 2480. Iron Paper Weight, round, with opening in center to hold ink bottle; weight, about 2 lbs., ... Each, $0 40
2482. Iron Paper Weight, square, with knob, large size, . " 75
2484. Lead " " covered with leather, about 4×2¼×1 in.; weight about 3 lbs., ... " 90

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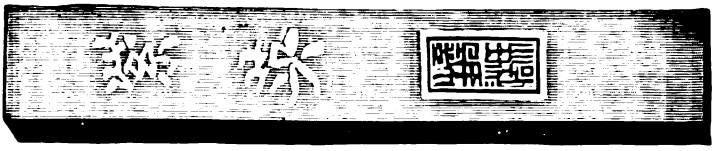
CHINESE OR INDIAN INKS

Our Own Direct Importation.

Illustrations full size.

B C E G K



L

No. 2600 Chinese or Indian Inks.

B.	First quality Lion Head, medium, $2\frac{3}{8}$ in. long, thick, Each,	$0	15
C.	" " " " large, $3\frac{1}{4}$ " " " "		25
E.	Square, black, gilt figures, $2\frac{1}{8}$ in. long, ... "		25
G.	" " " " $2\frac{3}{4}$ " " thick, ... "		60
K.	" " super super, small, $2\frac{7}{8}$ in. long, thick, "		30
L.	" " " " large, $3\frac{3}{8}$ " " " "		60

The most practical slabs for rubbing up above Inks uniformly and quickly are our improved Slate Ink Slabs, Nos. 3000-3001, with air-tight plate glass cover.

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Our Own Direct Importation.

Illustrations full size.

PX

R

No. 2652.

No. 2600. Chinese or Indian Inks.

	PX. Oblong, gilt,	3⅜ in. long, extra fine quality, .	Each, $2 70
	R. "	black, 3¾ " " " " " . .	" 4 50
2650.	Red Chinese Inks,	2¾ " "	" 30
2652.	Blue "	" 2¾ " "	" 30

The most practical slabs for rubbing up above Inks uniformly and quickly are our improved Slate Ink Slabs, Nos. 3000-3001, with air-tight plate glass cover.

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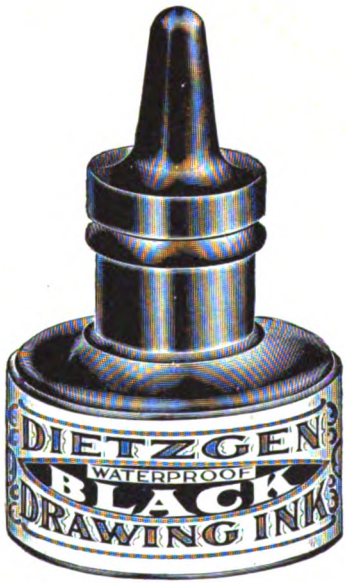
DIETZGEN
LIQUID DRAWING INKS

For Draftsmen and Artists.

Flows Freely. Dries Quickly.
Positively Waterproof.



Full Size.

Showing Original Wrapper.

Dietzgen Improved Liquid Waterproof Drawing Ink is made by new processes and formulae, the result of a long series of careful experiments. It is manufactured in our own laboratories where, under expert supervision, the most delicate chemical and physical tests are made. The specific gravity, viscosity, solubility, opacity, drying speed, etc., are determined with the utmost accuracy. Before placing the Ink on the market it is properly stored for a certain period, in order that a ripening or closer union of the ingredients may take place. The Dietzgen Ink has stood the most rigid and extended tests, and will be found to possess all the desirable features required in a reliable Ink for general drafting. It is extremely smooth-flowing, contains no chemicals injurious to instruments, and is kept accurately at a fixed standard of density and quality.

The **Waterproof Black Ink** is made from the highest grade of pure carbon; is of unsurpassed density, flows freely, dries quickly, and even the finest lines produced by it are absolutely opaque. It is perfectly waterproof when dry, so that color washes can be used safely over it.

The **Colored Inks** are exceedingly dense, true and brilliant. They can be used for lines or washes, are waterproof when dry, and may be thinned with distilled water, or mixed with each other to produce other shades.

For prices see next page.

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DIETZGEN LIQUID DRAWING INKS *Continued*

			¾ oz.	4 oz.	½ Pt.	Pt.	Qt.
No. 2681.	Dietzgen Waterproof	Black Ink,	$0 25	1 10	2 00	3 75	7 00
2682.	" "	Yellow "	25	1 10	2 00	3 75	7 00
2683.	" "	Orange "	25	1 10	2 00	3 75	7 00
2684.	" "	Scarlet "	25	1 10	2 00	3 75	7 00
2685.	" "	Carmine "	25	1 10	2 00	3 75	7 00
2686.	" "	Blue "	25	1 10	2 00	3 75	7 00
2687.	" "	Green "	25	1 10	2 00	3 75	7 00
2688.	" "	Brown "	25	1 10	2 00	3 75	7 00
2689.	" "	Brick Red "	25	1 10	2 00	3 75	7 00
2690.	" "	Vermilion "	25	1 10	2 00	3 75	7 00
2691.	" "	Violet "	25	1 10	2 00	3 75	7 00

DIETZGEN PHOTOGRAPHIC BLACK INK

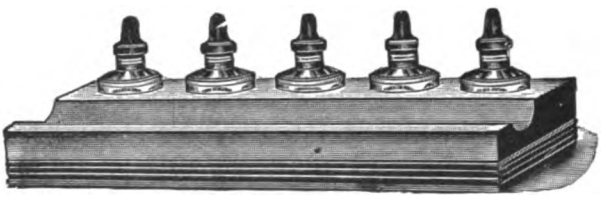
		¾ oz.	4 oz.	½ Pt.	Pt.	Qt.
No. 2695.	Dietzgen Photographic Black Ink,	$0 25	1 10	2 00	3 75	7 00

Our Photographic Black Ink is soluble and best adapted for fine line drawings, patent office drawings, tints and washes.

DIETZGEN MULTI-COLOR OR HEKTOGRAPH INKS

No. 2715-1.	Dietzgen Hektograph Ink, Black, . .	Per ¾ ounce bottle,	$0 50
2715-2.	" " " Blue, . .	" ¾ " "	15
2715-3.	" " " Brown, .	" ¾ " "	15
2715-4.	" " " Green, .	" ¾ " "	15
2715-5.	" " " Purple, .	" ¾ " "	15
2715-6.	" " " Red, . .	" ¾ " "	15
2715-7.	" " " Yellow, .	" ¾ " "	15

As a substitute for Black Ink the Purple answers best of all colored Inks.



No. 2720.

No. 2720. Practical Tray, containing any five of our Inks in ¾ oz. bottles, (assorted to order), ... Each, $1 60

2721. Practical Tray, without Ink, ... " 35

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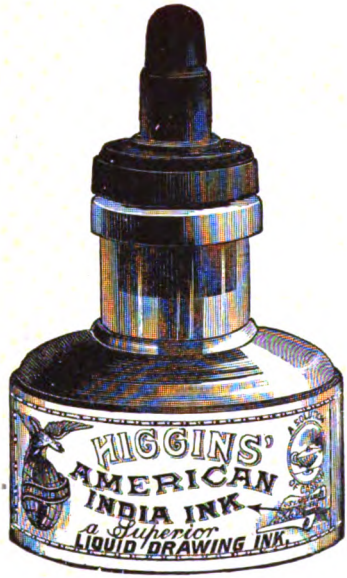
HIGGINS' LIQUID DRAWING INKS



No. 2731.

2735.

2736.

			¾ oz.	½ Pt.	Pt.	Qt.
No. 2730.	Higgins' General Black Ink, .	Each,	$0 25	2 00	3 75	7 00
2731.	" Waterproof Black Ink,	"	25	2 00	3 75	7 00
2732.	" Colored Inks, made in the following colors: . . .	"	25	2 00	3 75	7 00

Blue, Carmine, Orange, Violet,
Brick Red, Green, Scarlet, Yellow.
Brown, Indigo, Vermilion,

In ordering No. 2732, please state color of ink desired.

			2 oz.	½ Pt.	Pt.	Qt.
No. 2735.	Higgins' Eternal Ink, . .	Each,	$0 10	35	60	1 00
2736.	" Engrossing Ink, .	"	20	60	1 00	1 75

For Ink Bottle Holders see next page.

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INK BOTTLE HOLDERS

BOURGEOIS' LIQUID INK.

No. 2740.

No. 2742.

2750.

No. 2738. Iron Ink Bottle Holder and Paper Weight, coupling top, copper oxidized finish; weight about 8 oz., . . Each, $0 30

2740. Iron Ink Bottle Holder and Paper Weight, threaded top, copper oxidized finish; weight about 12 oz., . . Each, 50

These Bottle Holders are adapted for Dietzgen's or Higgins' ½ ounce ink bottles, and besides being very useful, are neat and attractive in appearance. The neck of the bottle projects so that it is just as handy for moving, cleaning or filling as if not in the holder.

No. 2742. Clover Ink Bottle Holder, holds 3 bottles, made of metal, Each, $0 50

(See also No. 2480, Iron Paper Weight.)

No. 2750. Bourgeois' Waterproof Black Ink, small size, . . " 25

2751. " " " " large " . . " 50

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W. & N.'S LIQUIDS AND PREPARATIONS

SEMPLE'S WHITE.

No. 2770.

2771.

No. 2770.	Winsor & Newton's Chinese White,	. .	Per bottle,	$0 30
2771.	" " Indian Ink,	. . .	"	30
2772.	" " Blue,	. . . . .	"	30
2773.	" " Carmine,	. . . . .	"	30
2774.	" " Indelible Brown Ink,	. .	"	30
2775.	" " Prout's Brown,	. . .	"	30
2776.	" " Sepia,	. . . . .	"	30
2777.	" " Gold Ink,	. . . . .	"	30
2778.	" " Oxgall,	. . . . .	"	30
2778½.	" " Vermilion,	. . . . .	"	30
2779A.	" " Chinese White in tubes, small size,		Each,	15
2779B.	" " " " " large		"	30

No. 2779C.

2779D.

2779S.

2779C.	W. & N's Albanine, a pure photographic white,	Each,	$0 30
2779D.	" Process Black, a dead black of great density,	"	30
2779S.	Semple's White, in jars,	"	25

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DIETZGEN DRAFTING ROOM AND LIBRARY PASTE

No. 2780.

2782.

No. 2780.	Dietzgen Drafting Room and Library Paste, Per	4 oz. jar,	$0 18
2781.	" " " " " " "	6 " "	25
2782.	" " " " " " "	1 pt. "	55

HIGGINS' ADHESIVES

No. 2787.

2790.

No. 2786.	Higgins' Drawing Board and Library Paste, Per	3 oz. jar,	$0 15
2787.	" " " " " " "	6 " "	25
2788.	" Photo Mounter, ...	" 3 " "	15
2789.	" " "	" 6 " "	25
2790.	" Office Paste, ...	" 4 " "	15
2791.	" " "	" 8 " "	25
2792.	" Taurine Mucilage, ...	" 2 " bot.,	10
2793.	" " "	" 4 " "	20

WEIS BRUSH TUBE MUCILAGE

No. 2798. Weis Brush Tube Mucilage, medium size, . . . Each, $0 10

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WINSOR & NEWTON'S

MOIST WATER COLORS

Whole Pan.

Half Pan.

Whole Tube.

1. Antwerp Blue	26. Gamboge	52. Payne's Grey
2. Bistre	28. Hooker's Green No. 1	53. Permanent Blue
3. Blue Black	29. Hooker's Green No. 2	54. Prussian Blue
5. Brown Ochre	30. Indigo	56. Prussian Green
6. Brown Pink	32. Indian Red	58. Raw Sienna
8. Burnt Sienna	34. Italian Pink	60. Raw Umber
9. Burnt Umber	36. Ivory Black	62. Roman Ochre
10. Charcoal Grey	38. King's Yellow	64. Sap Green
12. Chinese White	40. Lamp Black	66. Terre Verte
14. Chrome Lemon	42. Light Red	68. Vandyke Brown
16. Chrome Yellow	43. Mauve	70. Venetian Red
18. Cologne Earth	44. Naples Yellow	72. Vermilion
20. Deep Chrome	46. Neutral Tint	74. Yellow Lake
22. Dragon's Blood	47. New Blue	76. Yellow Ochre
24. Emerald Green	48. Olive Green	
25. Flake White	50. Orange Chrome	

No 2800P. Whole Pans, . Per doz., $3 00; Half Pans, . Per doz., $1 65
2800T. " Tubes (except Chinese White, see Nos. 2779A-B), " 3 00

---

90. Alizarin Carmine	106. Cerulean Blue	120. Roman Sepia
92. Alizarin Crimson	108. Crimson Lake	122. Ruben's Madder
94. Alizarin Green	110. Indian Yellow	124. Scarlet Lake
96. Alizarin Orange	111. Leitch's Blue	126. Scarlet Vermilion
98. Alizarin Scarlet	112. Mars Yellow	128. Sepia
99. Alizarin Yellow	114. Neutral Orange	130. Warm Sepia
102. Brown Madder	116. Orange Vermilion	
104. Carmine Lake	118. Purple Lake	

No. 2801P. Whole Pans, . Per doz., $6 00; Half Pans, Per doz., $3 00
2801T. " Tubes, ... " " 6 00

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200. Cadmium Orange	210. Indian Purple	221. Permanent Violet
201. Cadmium Lemon	212. Intense Blue*	222. Pale Cadmium Yellow
202. Cadmium Yellow	214. Lemon Yellow	224. Pure Scarlet*
204. Cobalt Blue	216. Mars Orange	225. Ultramarine Ash-Grey
206. Cobalt Green	218. Oxide of Chromium	226. Violet Carmine
207. Emerald Oxide of Chromium	219. Oxide of Chromium, Transparent	228. Viridian
208. French Blue	220. Permanent Mauve	

No. 2802P. Whole Pans, . Per doz., $7 50; Half Pans, Per doz., $3 75
2802T. " Tubes, ... " " 7 50

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300. Aureolin	309. Gallstone	316. Purple Madder
302. Aurora Yellow	310. Madder Carmine	318. Scarlet Madder
304. Burnt Carmine	311. Madder Lake	319. Rose Dorée
306. Carmine	312. Pink Madder	320. Rose Madder
308. Field's Orange Vermilion	314. Primrose Aureolin	322. Yellow Carmine

No. 2803P. Whole Pans, . Per doz., $12 75; Half Pans, Per doz., $6 38
2803T. " Tubes, ... " " 12 75

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400. Smalt
402. Ultramarine Ash-Blue

No. 2804P. Whole Pans, . Per doz., $18 00; Half Pans, Per doz., $ 9 00
2804T. " Tubes, ... " " 18 00

Colors marked thus * are not prepared in Tubes.

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TECHNICAL MOIST WATER COLORS

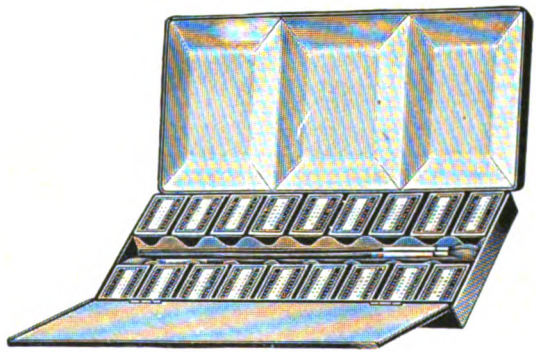
These Technical Moist Water Colors are intended for every description of coloring on professional (technical) drawings. They have been selected more with a view to sharp distinction, rather than to the representation of the actual colors of the materials, are always ready for use without mixing or dissolving, insuring uniform results and correct duplicating of tints.

Whole pan.

No. 2810.

Half pan.

					Whole Pans.	Half Pans.
No. 2810.	1. Cast Iron	7. Brick	13. Chinese White			
	2. Wrought Iron	8. Stone	14. Gamboge			
	3. Copper	9. Brown Stone	15. Prussian Blue			
	4. Brass	10. Leather	16. Vermilion			
	5. Steel	11. Light Wood	17. Yellow Ochre			
	6. Machinery	12. Dark Wood	. . . .	Each,	$0 18	$0 10
No. 2811.	18. Carmine			"	50	25



No. 2816.

			Each.
No. 2813.	Japanned Tin Box, cont'g	12 half Pans, Nos. 1 to 12 of above,	$2 00
2814.	" " " "	18 " " " 1 " 18 " "	3 00
2815.	" " " "	12whole " " 1 " 12 " "	3 35
2816.	" " " "	18 " " " 1 " 18 " "	5 00

Each box contains also 1 each Brushes No. 2920-2-6.

For Empty Tin Boxes see Nos. 2850-2858.

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BOURGEOIS' FRENCH WATER COLORS

IN GLASS POTS.

These pots contain more than double the quantity sold in whole pans of other manufacturers at nearly the same price.

They are in a moist state. The user has but to moisten his brush and slightly rub the colors desired to find that it will readily yield the full richness of its tint.

No. 2835. Each, $0 30

2. Antwerp Blue	28. Gamboge	54. Payne's Grey	
4. Brown Ochre	30. Green Lake	56. Prussian Blue	
6. Brown Pink	32. Hooker's Green	58. Prussian Green	
8. Burnt Sienna	34. Indian Red	60. Raw Sienna	
10. Burnt Umber	36. Indigo	62. Raw Umber	
12. Chinese White	38. Italian Pink	64. Sap Green	
14. Chrome Green, Light	40. Ivory Black	68. Terre Verte	
16. Chrome Green, Medium	42. Lamp Black	70. Vandyke Brown	
18. Chrome Green, Dark	44. Lemon Yellow	72. Venetian Red	
20. Chrome Yellow, Light	46. Light Red	76. Yellow Ochre	
22. Chrome Yellow, Dark	48. Naples Yellow		
24. Dragon's Blood	50. Neutral Tint		
26. Emerald Green	52. Olive Green		

No. 2836. Each, $0 50

100. Brilliant Yellow	109. Sepia	114. Vermilion, Light	
102. Celestial Blue	110. Ultramarine Blue, Light	116. Vermilion, Dark	
104. Crimson Lake		118. Violet Light, Extra	
106. Dark Purple	112. Ultramarine Blue, Dark	120. Violet Dark, Extra	
108. Scarlet Vermilion		122. Warm Sepia	

No. 2837. Each, $0 75

200. Brown Madder	208. Cypress Green, Dark	216. Rose Carthame, Light	
202. Carmine	210. Geranium Rose	218. Rose Carthame, Dark	
204. Cerulean Blue	212. Madder Lake, Light	220. Scarlet Lake	
206. Cypress Green, Light	214. Madder Lake, Dark		

No. 2838. Each, $1 00

300. Cadmium Citron	304. Cadmium Yellow	308. Indian Yellow
302. Cadmium Deep	306. Cobalt Blue	

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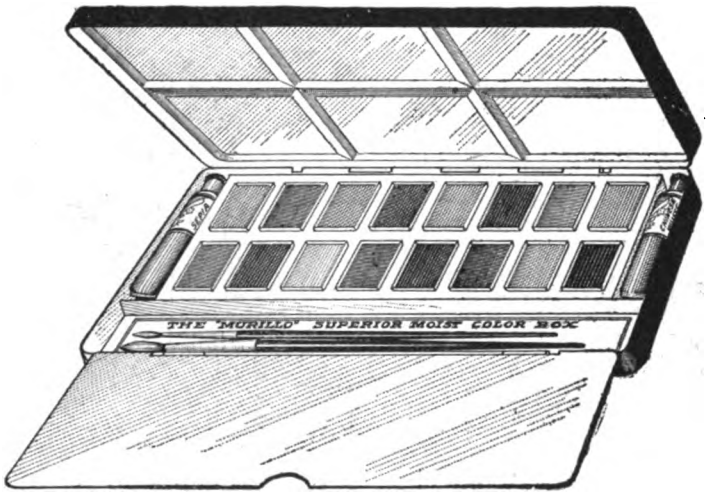
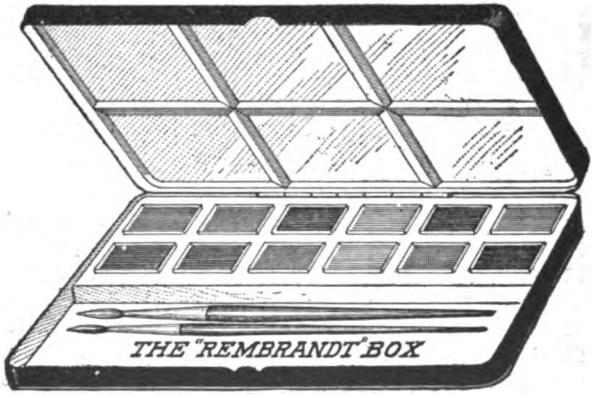
WATER COLOR BOXES



No. 2840.

No. 2840. Murillo Water Color Box, japanned tin box, 7½×3¼ in., with inside lid, 16 moist colors in metal pans, 1 tube each Chinese White and Sepia, 2 brushes, ... Per doz., **$12 00**

2841. Small Murillo Water Color Box, japanned tin box, 6½×3¼ in., 12 moist colors in metal pans, 1 tube each Chinese White and Sepia, 2 brushes, ... Per doz., **9 00**



No. 2842.

No. 2842. Rembrandt Water Color Box, japanned tin box, 6¼×2¾ in., 12 moist colors in metal pans, 2 brushes, ... Per doz., **$5 00**

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WINSOR & NEWTON'S

WATER COLOR BOXES

Fitted with Cake Water Colors.

No. 2845A.

No. 2845C.

2846H.

FULL CAKE BOXES FITTED

No. 2845A.	12 Cakes, Mahogany "Slide Lid" Box, . . .	Each,	$ 5 00
2845B.	18 " " " " " . . .	"	7 50
2845C.	12 " " "Lock and Drawer" Box, fitted,	"	7 25
2845D.	18 " " " " " " "	"	10 00
2845E.	12 " " "Complete" Box, fitted. . .	"	9 00
2845F.	18 " " " " " . .	"	13 50
2845G.	24 " " " " " . .	"	18 00

HALF CAKE BOXES FITTED

No. 2846A.	12 Half Cakes, Mahogany "Slide Lid" Box, . .	Each,	$ 2 75
2846B.	18 " " " " " . .	"	4 00
2846C.	12 " " " "Lock and Drawer" Box, fitted,	"	5 25
2846D.	18 " " " " " " "	"	6 50
2846E.	12 " " " "Complete" Box, fitted, .	"	6 00
2846F.	18 " " " " " " . .	"	7 75
2846G.	12 " " " "Caddy Lid" Box, complete, fitted, ...	"	8 50
2846H.	18 Half Cakes, Mahogany "Caddy Lid" Box, complete, fitted, ...	"	10 75

The "Slide Lid" Box contains Brushes, and the "Lock and Drawer" and "Complete" Boxes contain Brushes, Pencils, Ink and Slant. The "Caddy Lid" Box contains Sable Brushes and superior fittings.

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EMPTY JAPANNED TIN BOXES

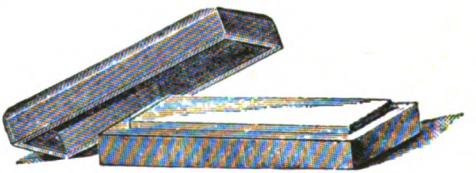
For Moist Colors in Pans.

No. 2854.

No. 2850.	For 6 Whole or 12 Half Pans,	Each,	$0 80
2851.	" 8 " " 16 " "	"	90
2853.	" 10 " " 20 " "	"	1 05
2854.	" 12 " " 24 " "	"	1 15
2855.	" 16 " " 32 " "	"	1 30
2857.	" 18 " " 36 " "	"	1 40
2858.	" 24 " " 48 " "	"	1 60

ARKANSAS OIL STONES

No. 2890.



2895.

No. 2890.	Arkansas Oil Stone, wedge shape slip,	Each,	$0 30
2891.	" " " about $1\frac{1}{4}\times 3$ in.,	"	50
2892.	" " " " $1\frac{1}{4}\times 4\frac{3}{8}$ in.,	"	90
2895.	" " in case, with cover, 3 in.,	"	75
2896.	" " " " 5 "	"	2 00

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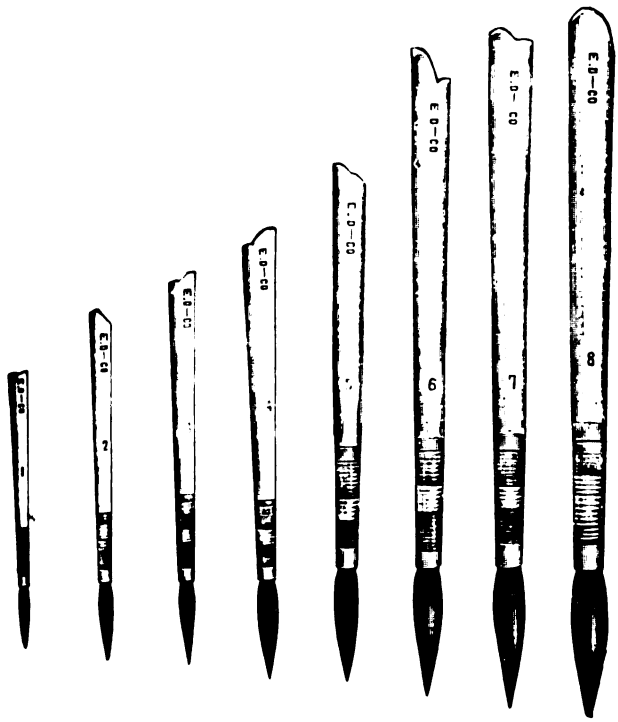
QUILL BRUSHES

Of Camel Hair and Red Sable.

Illustrations full size.



Nos. 2900–2901.

No. 2900.	Camel Hair in Quills.								
	Nos. . . .	1	2	3	4	5	6	7	8
	Each, . . .	$0 05	05	06	06	08	08	10	10
No. 2901.	Red Sable in Quills.								
	Nos. . . .	1	2	3	4	5	6	7	8
	Each, . . .	$0 15	25	35	45	55	70	85	1 00

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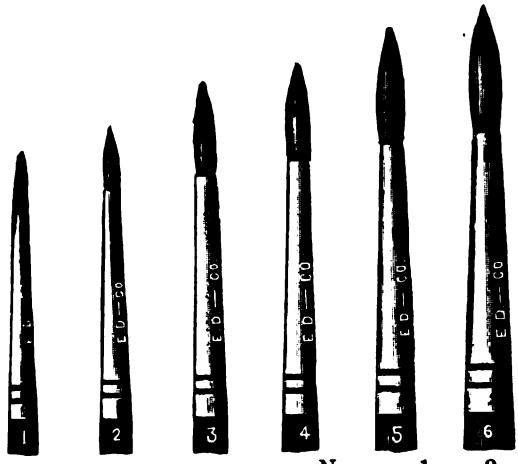
CAMEL HAIR BRUSHES

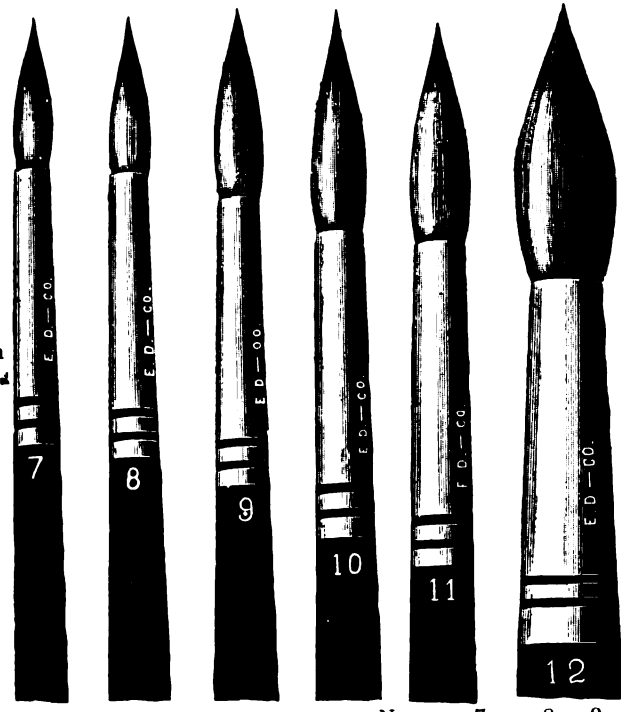
In Tin with Handle.



Illustrations full size.

	Nos.	1	2	3	4	5	6
No. 2920. Camel Hair Brushes, ...	Each,	$0 06	08	08	10	10	12

In Tin with Handle.



Illustrations full size.

	Nos.	7	8	9	10	11	12
No. 2920. Camel Hair Brushes, ...	Each,	$0 18	20	20	25	30	35

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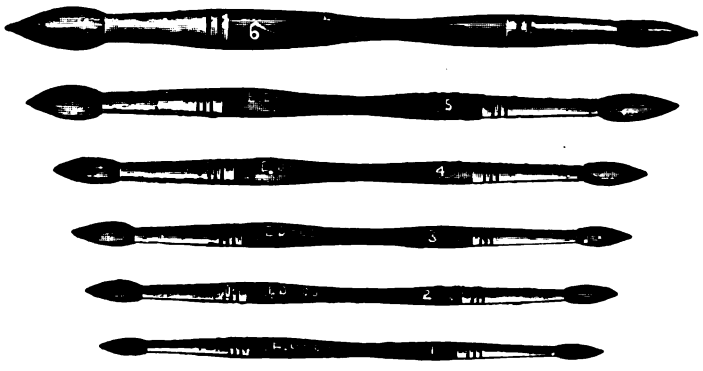
DOUBLE-POINTED BRUSHES

Of Camel Hair and Red Sable.

Illustrations ½ size.

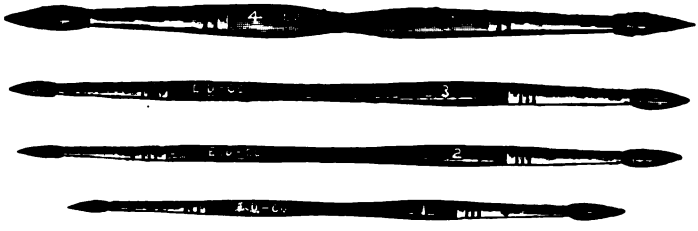


No. 2930.

No. 2930. Double-pointed Camel Hair Brushes, in Tin.

Nos.	1	2	3	4	5	6
Each,	$0 25	30	35	45	55	60

Illustrations less than ½ size.



No. 2933.

No. 2933. Double-pointed Red Sable Brushes, in Albata.

Nos.	1	2	3	4
Each,	$0 60	90	1 50	2 40

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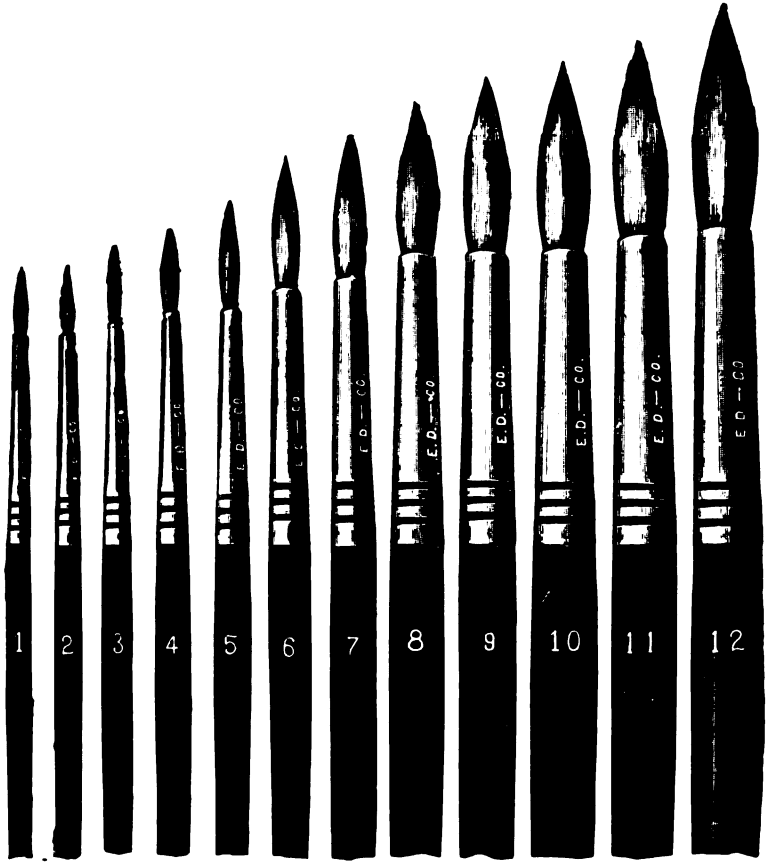
RED SABLE BRUSHES

In Albata, with Handle.

Illustrations full size.



No. 2940.

No. 2940. Red Sable Brushes, in Albata, with Handle.

Nos. .	1	2	3	4	5	6	7	8	9	10	11	12
Each,	$0 15	18	25	30	40	55	70	90	1 20	1 50	2 00	2 50

We omit to list the Black Sable Brushes because they are more expensive and at the same time less firm in their points than the Red Sable Brushes.

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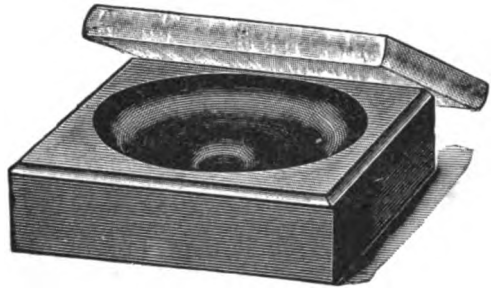
SLATE INK SLABS

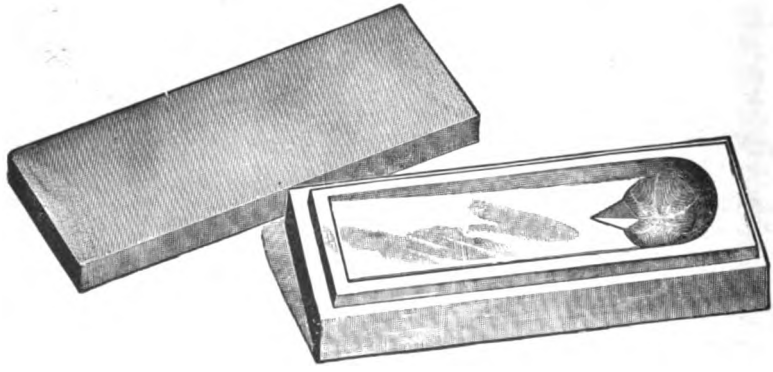


No. 3000.

Slate Ink Slabs Nos. 3000-3001, heavy Plate Glass Cover, with ground edges, are the *best* for rubbing up Chinese or Japanese Inks uniformly and quickly. The Plate Glass Cover fits air-tight, and the deep well in the center gathers the ink for convenient filling of the pen.

No. 3000.	Slate Ink Slab, 3½ in. square, with improved well, .	Each,	$0 45
3001.	" " " 5 " " " " " . .	"	65
3005.	" " " 3½ " " plate glass cover, with edges not ground, and less heavy than No. 3000	"	35

CHINA INK SLABS



No. 3007.

No. 3007.	China Ink Slab, with cover, 1¾×4½ in., ...	Each,	$0 35
3008.	" " " " " 2⅛×5¼ "	"	40

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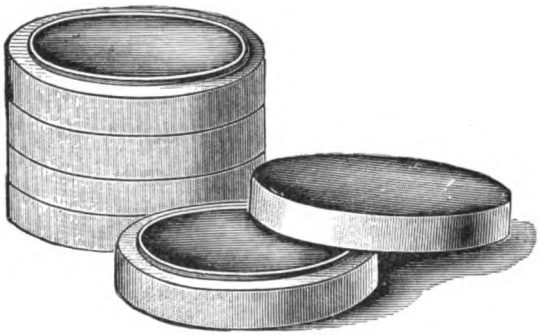
NESTS OF CABINET SAUCERS

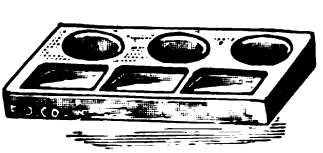


No. 3010.

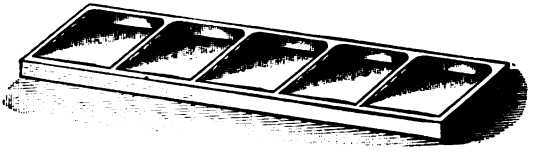
No. 3010.	Nest of Cabinet Saucers, 6 in set, 2⅜ in.,	Each,	$0 55
3011.	" " " 6 " 2⅝ "	"	65
3012.	" " " 6 " 3¼ "	"	75
3013.	" " " 6 " 3¾ "	"	90
3014.	" " " deep, 4 in set, 2⅜ in.,	"	75
3015.	" " " " 4 " 3¼ "	"	90
3016.	" " " " 4 " 3¾ "	"	1 10

A "Nest of 6" consists of 5 saucers and cover; a "Nest of 4" of 3 saucers and cover.

INK AND COLOR SLABS



No. 3025.



3032.

No. 3025.	Color Slabs, 3 wells and 3 slopes, 2½×4 in.,	Each,	$0 25
3026.	" " 5 " " 5 " 4 ×7½ "	"	60
3032.	Sloping Tiles, 5 divisions, 3⅛×7¾ in.,	"	40
3033.	" " 6 " 3⅛×7¾ "	"	40
3034.	" " 8 " 6 ×7⅝ "	"	60

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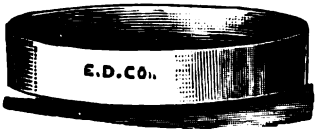
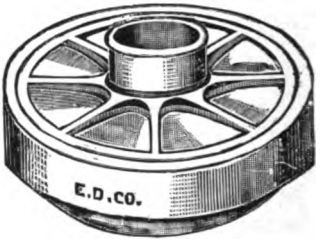
INK AND COLOR SLABS *Continued*

No. 3042.



No. 3040.



3045.

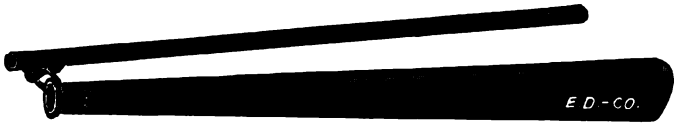
No. 3040.	China Color Cups, ...	2½	3	3½	in. diameter.
	Each, ...	$0 07	10	20	
3042.	China Brush Rest, 5½ in. long, ...				Each, $0 15
3045.	Architects' Slant and Basin, 8 divisions and cup, 7 in. diam., Each, ...				1 35

No. 3050.

ARTISTS' WATER GLASSES

No. 3050.	Artists' Water Glass, 2⅜ in. diameter, Each, ...	$0 12
3052.	Artists' Water Glass, 3¼ in. diameter, Each, ...	25

ATOMIZER



No. 3060.

No. 3060. Atomizer, japanned tin, folding, ... Each, $0 15

FIXATIF

No. 3062. Colorless Fixatif, for Crayon or Charcoal, Per 3-oz. bottle, ... $0 20

3063. Colorless Fixatif, for Crayon or Charcoal, Per pint bottle, ... 1 00

No. 3062.

CHARCOAL

No. 3070.	Charcoal, fine, 50 sticks in a box, . .	Per dozen boxes, $1 80
3072.	" Venetian, 50 sticks in a box, .	" " " 6 00

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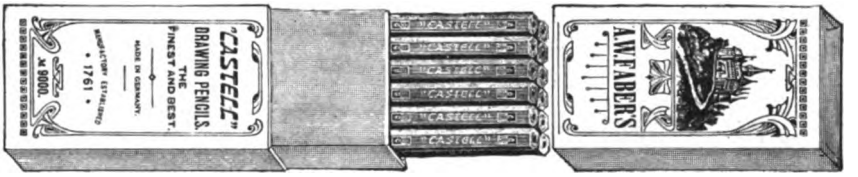
A. W. FABER'S CASTELL PENCILS



No. 3090.

The graphite contained in these pencils has been especially purified by a new chemical process, resulting in the production of a lead which for purity, delicacy of tone, uniformity or density of texture, durability or perfect grading, stands unequaled.

They can be sharpened to the finest point, possess great resistance to wear and produce, even in the hardest degrees, black, clearly defined lines.

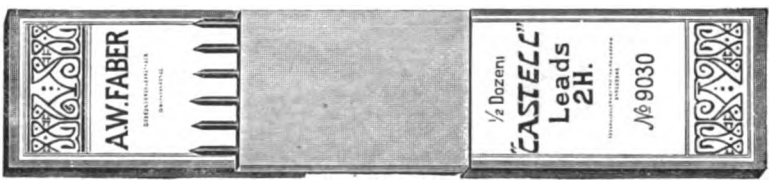
No. 3090. Castell Pencils, Hexagon, Green Polish. In degrees as follows: 6B, 5B, 4B, 3B, 2B, B, HB, F, H, 2H, 3H, 4H, 5H, 6H, 7H, 8H, ... Per doz., $1 25

No. 3092.

No. 3092. Castell Pencil, Hexagon, Green Polish, with gilt metal ferrule and red rubber tip, one degree only, HB, . . Per doz., $1 35

No. 3094.

No. 3094. Castell Artists' Pencil, white tip, single pointed, with lead, ... Each, $0 25



No. 3095.

No. 3095. Castell Leads, 6 in box, all grades, from 6B to 8H. Per box, $0 65

No. 3097.

No. 3097. Castell Copying Ink Pencils, Violet, round, . Per doz., $1 25
3098. " " Pencils, Black, soft lead, round, " " 1 25
3099. " " " " hard " " " " 1 25

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A. W. FABER'S PENCILS - *Continued*

No. 3101.

No. 3101. A. W. Faber's Hexagon Gilt Pencils, Nos. 1,2,3,4,5,6, Per doz.,$0 75

A. W. FABER'S COLORED PENCILS

No. 3125.

No. 3122.	Red and Blue Pencils, hexagon, best,	Per doz.,	$1 25
3123.	" " " " round,	"	75
3124.	Red Pencils, round,	"	75
3125.	Blue " "	"	75
3126.	Yellow " "	"	75
3127.	Green " "	"	75

A. W. FABER'S POLYCHROMOS WAX CRAYONS

No. 3150.

YELLOWS

2. Zinc Yellow.
3. Lemon Cadmium.
4. Light Chrome.
5. Light Cadmium.
6. Dark Cadmium.
7. Naples Yellow.
8. Dark Chrome.
9. Orange.

GREENS

10. Terre Verte.
11. Olive Green.
12. Mineral Green.
13. French Green.
14. Green Bice.
15. Sap Green.
16. Hooker's Green, No. 1.
17. " " No. 2.
18. Viridian.
19. Vegetable Green.
20. Prussian Green.

BLUES

21. Light Blue.
22. Sky Blue.
23. Cobalt Blue.
24. Ultramarine.
25. Paris Blue.
26. Prussian Blue.
27. Indigo.
28. Delft Blue.

REDS

31. Pink Madder Lake.
32. Madder Carmine.
33. Rose Pink.
34. Carmine Lake.
35. " Extra Fine.
36. Scarlet Lake.
37. Saturn Red.
38. Pale Vermilion.
39. Dark Vermilion.
46. Venetian Red.
47. Brick Red.
48. Terra Cotta.
49. Indian Red.
50. Burnt Carmine.

BROWNS

40. Light Ochre.
41. Raw Sienna.
42. Gold Ochre.
43. Burnt Yellow Ochre.
44. Brown Ochre.
45. Burnt Sienna.
51. Raw Umber.
52. Bistre.
53. Van Dyke Brown.
54. Burnt Umber.
55. Sepia.
56. Warm Sepia.

VARIOUS

1. White.
29. Red Violet Lake.
30. Blue " "
57. Light Gray.
58. Neutral Tint.
59. Payne's Gray.
60. Ivory Black.

		Each.	Per Doz.
No. 3150.	A. W. Faber's Polychromos Wax Crayons, 60 colors, as listed above,	$0 10	$1 00

3155. A. W. Faber's Polychromos Wax Crayons in boxes. Assorted Colors,

6	12	18	24	36	48
$0 75	1 10	1 65	2 15	3 00	4 00

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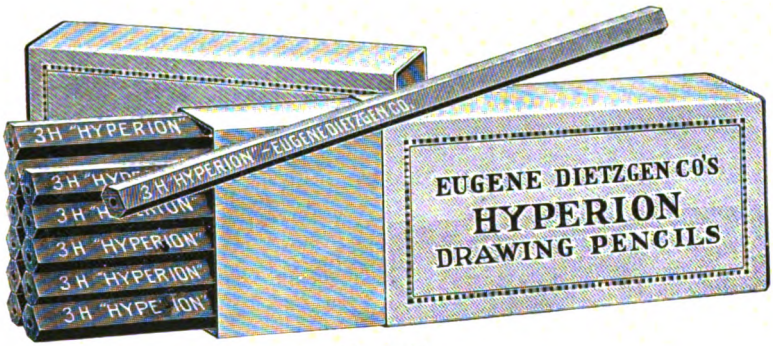
HYPERION DRAWING PENCILS



No. 3200.

The Hyperion Drawing Pencils are of superior quality, correctly and uniformly graded, contain no grit and will hold their points well. They are made in 10 degrees of hardness to meet all practical requirements.

No. 3200. Hyperion Drawing Pencils, Hexagon, Yellow Polish. In degrees as follows: 2B, B, HB, F, H, 2H, 3H, 4H, 5H, 6H, ... Per doz., $0 60

HYPERION COPYING INK PENCILS

No. 3210.

No. 3210. Hyperion Copying Ink Pencils, Violet, round, . Per doz., $0 75

Copying Ink Pencils are rapidly becoming popular as a substitute for ink. They are excellent for signing letters and for general writing from which copies are to be made; clear, sharp copies are obtained.

Our "Hyperion" Copying Ink Pencils are manufactured by a special compression process, and are noted for their smooth, durable lead and remarkable lasting qualities.

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HARDTMUTH'S KOH-I-NOOR PENCILS

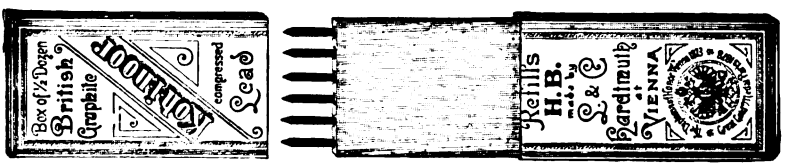
No. 3250.

By a new process of manufacture the graphite assumes a highly compressed form, which secures for it remarkable lasting qualities, the pencil point remaining sharp for a surprisingly long time. For the draftsman and others, where the preservation of a fine point is of importance, the Koh-i-noor Pencils and Leads will be found invaluable.

No. 3250. Koh-i-noor Pencils, Hexagon, Yellow Polish. In degrees as follows:
3B, 2B, B, HB, F, H, 2H, 3H, 4H, 5H, 6H, 7H, 8H, 9H, Per doz., $1 25
4 B, ... " 1 50
6 B, 5 B, ... " 1 80

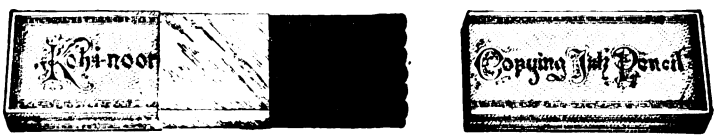
No. 3260.

No. 3260. Koh-i-noor Artists' Pencil with lead, double pointed, . Each, $0 35
3261. " " " " single " . " 25



No. 3270.

No. 3270. Koh-i-noor Leads, 6 in box, all grades, from 6 B to 8 H, Per box, $0 65



No. 3271.

No. 3271. Koh-i-noor Copying Ink Pencils, Violet, round, . . Per doz., $1 25

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HARDTMUTH'S MEPHISTO PENCILS

No. 3273.

No. 3273. Hardtmuth's Mephisto Pencils, Hexagon, Black Polish. In 6 degrees, as follows: Nos. 1 = BBB, 2 = B, 3 = HB, 4 = HH, 5 = HHH, 6 = HHHH, ... Per doz., $0 75

No. 3275V.

			Per doz.
No. 3275V.	Mephisto Copying Ink Pencils,	No. 73B, Violet, round,	$0 75
3275B.	" " " " "	73B, Blue, "	75
3275D.	" " " " "	73B, Black, "	75
3275G.	" " " " "	73B, Green, "	75
3275R.	" " " " "	73B, Red, "	75
3275½.	" " Ext. Hard " "	73B, Violet, "	85
3276.	" " Red Tip " "	77, " "	85

No. 3280.

No. 3280. Hardtmuth's Wax Crayons, in wood: No. 51, Gamboge; No. 52, Orange Chrome; No. 57, Raw Sienna; No. 60, Vandyke Brown; No. 63, Sepia; No. 64, Black; No. 67, Sap Green; No. 71, Light Green; No. 75, Cobalt Blue; No. 78, Dark Blue; No. 80, Violet Carmine; No. 85, Vermilion; No. 87, Rose Madder; No. 94, Yellow; No. 100, White; Per doz., $1 00; Each, $0 10

3285. Hardtmuth's Red Pencils, round, ... Per doz., 75
3286. " Blue " " . . . . . " 75
3287. " Red and Blue Combination Pencils, round, " 75

No. 3291.

3290. Hardtmuth's Round Lumber Crayons, Black, . . Per doz., $0 50
3291. " " " " Blue, . . " 50
3292. " " " " Red, . . " 60

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DIETZGEN DETAIL PENCILS

No. 3295.

No. 3295. Dietzgen Detail Drawing Pencils, Nos. 1, 2, 3, 4, 5, Per doz., $0 35
3296. " Sketching Pencils, ... " 50

No. 3297.

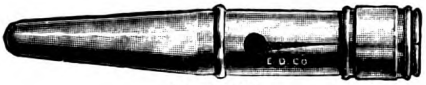
No. 3297. Dietzgen "Junior" Pencils, round, grade No. 2, rubber tipped,
. . . . . Per doz., $0 30

PENCIL HOLDERS

No. 3298.

No. 3299.

No. 3298. Dietzgen Pencil Holder, single end, ... Each, $0 05
3299. " " " double end, ... " 10



No. 3300.

3302.

No. 3300. Pencil Point Protector, round, ... Each, $0 05
3302. " " " and Finger Grip (metal, rubber
covered), ... " 05

No. 3304.

3306.

No. 3304. Pencil Point Protector, hexagon, with rubber, . . . Each, $0 05
3306. Rubber Pencil Tips, hexagon, ... Per doz., 15

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DIXON'S PENCILS AND CRAYONS

No. 3310.

No. 3310. Dixon's "Cabinet" Pencils, hexagon, rubber tipped, stamped in gold, grades No. 2 and 3, . . . Per doz., $0 50

No. 3311B.

No. 3311B.	Dixon's	"Best"	Solid	Crayons,	Blue,	round,	7 in.,	Per doz.,	$1 00
3311D.	"	"	"	"	Black,	"	7 "	"	1 00
3311G.	"	"	"	"	Green,	"	7 "	"	1 00
3311R.	"	"	"	"	Red,	"	7 "	"	1 00
3311Y.	"	"	"	"	Yellow,	"	7 "	"	1 00

No. 3311H.

No. 3311H. Dixon's Solid Crayon Holder, nickel-plated, 6½ in., for Crayons Nos. 3311B–3311Y, ... Per doz., $0 60

No. 3313D.

No. 3312B.	Dixon's	Lumber	Crayon,	Blue,	hexagon,	. .	Per doz.,	$1 20
3312G.	"	"	"	Green,	"	. .	"	1 20
3312R.	"	"	"	Red,	"	. .	"	1 20
3312T.	"	"	"	Ter. Cotta,	"	. .	"	1 20
3312W.	"	"	"	White,	"	. .	"	1 20
3312Y.	"	"	"	Yellow,	"	. .	"	1 20
3313D.	"	"	"	Black,	"	extra soft,	"	1 00

METAL WORKERS' CRAYON

No. 3315. Metal Workers' Crayon, 5 in., ... Per doz., $0 50

RED CHALK

No. 3315½. Red Chalk (Keel), in fingers (chunks),. . . . Per lb., $0 15

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BLAISDELL'S
PAPER PENCILS AND CRAYONS

No. 3316B.

No. 3316A.	Blaisdell's Paper Pencils, plain, grade No. 2, .	Per doz.,	$0 50
3316B.	" " " with rubber tip, grade No. 2, "		60

No. 3317A.

No. 3317A.	Blaisdell's Crayons, Blue, ...	Per doz.,	$0 90
3317B.	" " Red, ...	"	90
3317C.	" " Black, ...	"	90
3317D.	" " Green, ...	"	90
3317E.	" " Yellow, ...	"	90
3317F.	" " Brown, ...	"	90
3317G.	" " White, ...	"	90

DIETZGEN "UNION" LUMBER CRAYONS

EXTRA LARGE SIZE.

No. 3319B.

No. 3319B.	Union Lumber Crayons, Blue, hexagon, . .	Per doz.,	$0 80
3319D.	" " " Black, " . .	"	80
3319G.	" " " Green, " . .	"	80
3319R.	" " " Red, " . .	"	80
3319T.	" " " Brown, " . .	"	80
3319Y.	" " " Yellow, " . .	"	80

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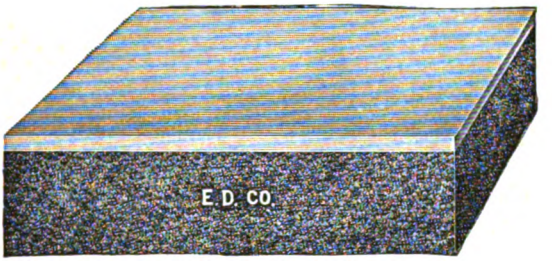
SPONGE RUBBER

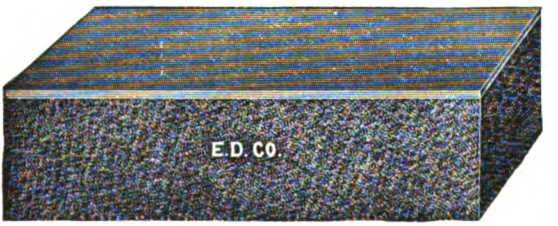
For Cleaning Drawings.



No. 3321.

Full Size Illustration.

No. 3321. Sponge Rubber, medium, rubber back, $2\frac{1}{2} \times 1\frac{3}{4} \times \frac{5}{8}$ in., Each, **$0 30**

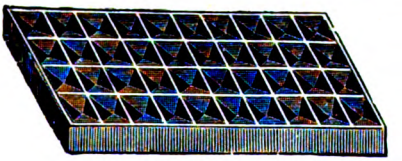


No. 3322.

No. 3321A.	Sponge Rubber, 1×1×1 in.,	Each,	$0 12
3321B.	" " 2×2×1 "	"	30
3322.	" " 4×2×1 "	"	60
3323.	" " 6×4×1 "	"	1 80

Nos. 3321-3323, Sponge Rubbers, are best adapted for cleaning drawings, etc., without disturbing drawn lines or figures or surface of paper.

MOLDED RED RUBBER



No. 3325.

No. 3325. Molded Red Rubber, for cleaning drawings and erasing pencil marks, ... Each, **$0 20**

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RUBBER PENCIL ERASERS

No. 3330.

3332.

No. 3330. Velveteen Rubber, **gray,** oblong, beveled, 3 sizes.

Pieces to the box,	48	24	12
Per piece,	$0 06	12	25
Per box,			$2 50

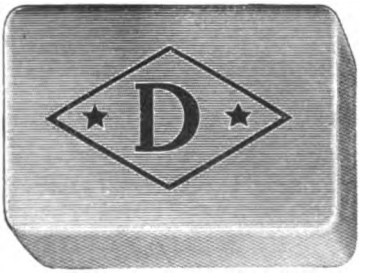
3332. Viridian Rubber, **green,** oblong, beveled, 3 sizes.

Pieces to the box,	48	24	12
Per piece,	$0 06	12	25
Per box,			$2 50

No. 3333.

No. 3333. Maroon Rubber, **red,** oblong, beveled, 3 sizes.

Pieces to the box,	48	24	12
Per piece,	$0 06	12	25
Per box,			$2 50



No. 3335.

No. 3335. Dietzgen Flexible Rubber, **gray,** flat, 6 sizes.
3336. " " " **pink,** " 6 "

Pieces to the box,	40	30	20	12	8	4
Per piece,	$0 06	08	12	20	30	60
Per box,						$2 25

Nos. 3330-3336 Rubber Erasers are made of the finest quality erasive rubber. They are soft and flexible and erase rapidly without injuring the surface of the paper.

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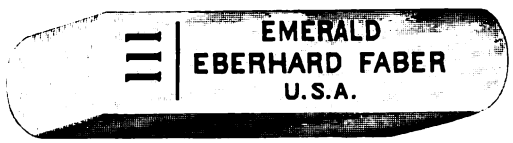
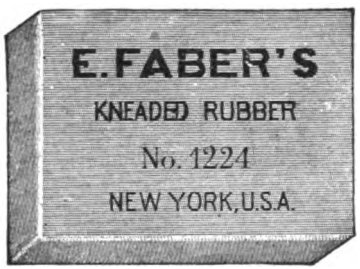
RUBBER PENCIL ERASERS *Continued*



No. 3341B.

No. 3341A.	E. Faber's Emerald Eraser, green,			small,	.	Per doz.,	$0 60
3341B.	"	"	"	medium,	.	" "	80
3341C.	"	"	"	large,	. .	" "	1 50
3343A.	"	Ruby	" red,	small,	. .	" "	60
3343B.	"	"	"	medium,	.	" "	80
3343C.	"	"	"	large,	. .	" "	1 50



No. 3345.

3350.

			Each.
No. 3344.	E. Faber's Kneaded Rubber, small,	Per box of 36,	$1 80; $0 06
3345.	" " " large,	" " 12,	1 20; 12

3350. A. W. Faber's Artists' Rubber.

Pieces to the box,	40	30	24	20	16	12	8	4
Per piece, . .	$0 08	10	12	15	18	25	40	75
Per box, ...								$2 75

ART GUM

No. 3351B.

For cleaning engravings, drawings, paintings, books and papers. Is soft and friable and entirely free from grit. It wears itself away, but does not mar or scratch the surface of the paper.

No. 3351A.	Art Gum, $1\frac{1}{8} \times 1\frac{1}{8} \times 1\frac{1}{8}$ in., ...	Each,	$0 05
3351B.	" " $2 \times 1 \times 1$ in., ...	"	07
3351C.	" " $2\frac{1}{4} \times 1\frac{1}{8} \times 1\frac{1}{8}$ in., ...	"	10
3351D.	" " $3 \times 2 \times 1$ in., ...	"	15
3351E.	" " $3 \times 3 \times 2$ in., ...	"	25

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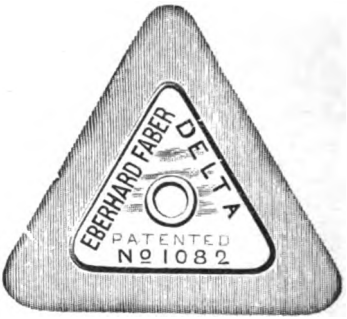
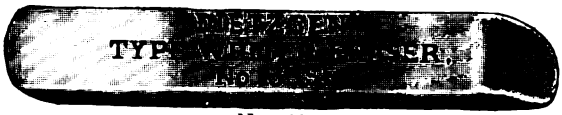
RUBBER INK ERASERS

No. 3352.



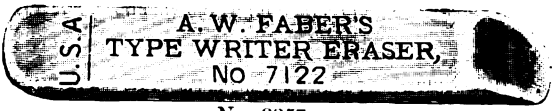
3354.

No. 3352. Faber's Circular Eraser, ... Per doz., $0 60
3354. " Delta " . . . . . " 70



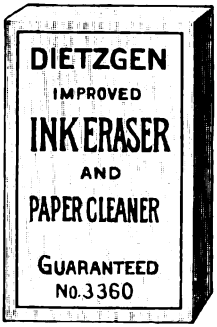
No. 3355.

No. 3355. Dietzgen Typewriter Eraser, small, ... Per doz., $0 60
3356. " " " large, ... " 1 20

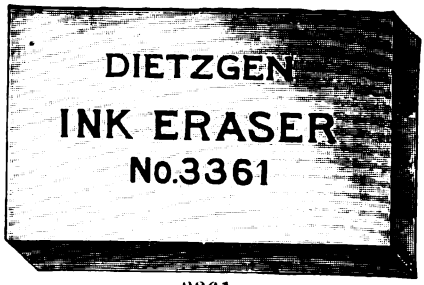


No. 3357.

No. 3357. Faber's Typewriter Eraser, small, ... Per doz., $0 60
3358. " " " large, ... " 1 20



No. 3360.



3361.

No. 3360. Dietzgen Ink Eraser, small, Per box of 50, $2 50; Each, $0 06
3361. " " " large, " " 25, 2 50; " 12
3362. " " " extra large. " 12, 2 50; " 25

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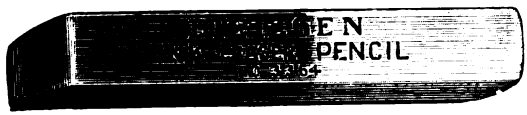
RUBBER INK AND PENCIL ERASERS



No. 3364.

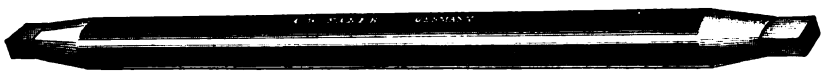
No. 3364. Dietzgen Ink and Pencil Eraser, ... Per doz., $0 60

No. 3365.

No. 3365. Dietzgen Ink and Pencil Eraser, large, . . Per doz., $1 00

No 3370.

No 3370. A. W. Faber's Ink and Pencil Eraser, in wood, . Each, $0 15
3371. " " " " large, " 25



No. 3375.

No. 3375. A. W. Faber's Ink and Pencil Eraser, in pencil form, Each, $0 15
3376. " Ink Eraser, in pencil form, . . " 15
3377. " Pencil Eraser, in pencil form, . . " 15

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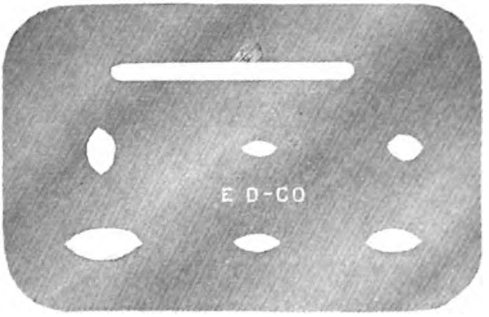
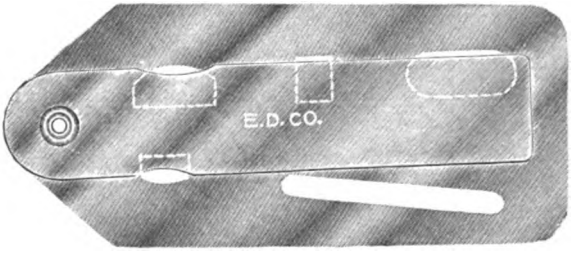
ERASING SHIELDS



No. 3378.

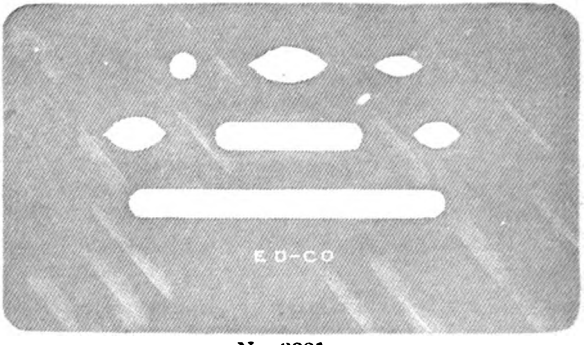
No. 3378. Metal Erasing Shield, nickel-plated, $2\frac{3}{8} \times 3\frac{3}{4}$ inches, . Each, $0 20



No. 3379.

No. 3379. Metal Adjustable Erasing Shield, nickel-plated, $1\frac{7}{8} \times 4\frac{1}{2}$ inches, ... Each, $0 30

By moving the adjustable arm over any opening in the shield part, an aperture of any desired size may be obtained, so that a line closely surrounded by others may be removed neatly and quickly, without affecting the adjacent lines.



No. 3381.

No. 3381. Celluloid Erasing Shield, transparent, $2\frac{1}{2} \times 4\frac{1}{2}$ inches, Each, $0 20
3383. " " " " 3×5 " " 25

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STEEL ERASERS

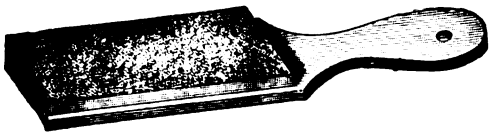
Nos. 3390–3391½.

No. 3390.	Steel Eraser, cocoa handle, Domestic,	Each, $0 35
3391.	" " white bone handle, Domestic,	" 50
3391½.	" " " " " Imported,	" 75

Nos. 3395–3396½.

No. 3395.	Steel Eraser, cocoa handle, Domestic,	Each, $0 45
3395½.	" " " " Imported,	" 70
3396.	" " white bone handle, Domestic,	" 60
3396½.	" " " " " Imported,	" 90

PENCIL POINTERS



No. 3416.

No. 3410.	Pencil Pointer, 1½×4 in.,	Each, $0 10
3412.	" " 2½×4 "	" 12
3416.	" " 1½×4 " with handle,	" 15
3417.	" " 2½×4 " " "	" 20

Above Pencil Pointers consist of a number of sheets of flint paper made into a block.

No. 3418.

No. 3418. Steel Pencil Pointer (File) and Tack Lifter, 6½ in., Each, $0 25

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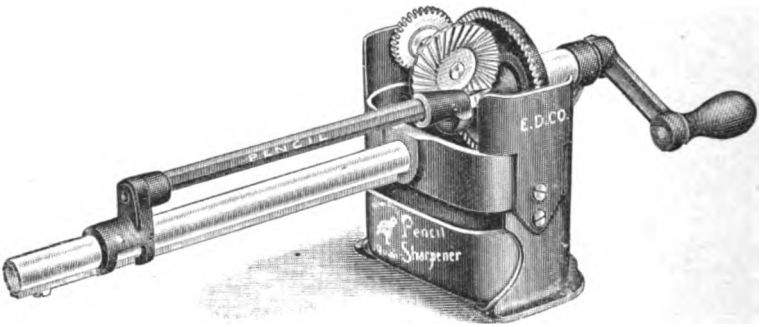
PENCIL SHARPENERS

THE "QUAIL" VISIBLE PENCIL SHARPENER



No. 3420.

No. 3420. The Quail Visible Pencil Sharpener, ... Each, $7 50
3421. Extra cutting wheel for Quail Visible Pencil Sharpener, " 65

The Quail Visible Pencil Sharpener is an exceptionally well made and practical sharpener, constructed on correct mechanical principles.

Pencils and crayons, wood or paper covered, of any diameter up to $\frac{7}{16}$ of an inch and as short as 1½ inches in length, can be quickly and easily sharpened to a perfect point, *without waste or danger of breaking the point.*

The construction is such that the pencil remains stationary, overcoming any friction with the cutting mechanism, and as the point is ***visible*** while operating the machine, the process of sharpening can be closely watched and the desired fineness of point obtained. The compound rotating of the cutting wheel makes the machine very rapid in operation; and the cutting wheel being large and made of the best quality steel, it remains sharp for a long time.

This Sharpener can be attached permanently to the table or drawing board by means of screws, or temporarily by a strong, effective clamp furnished with each instrument.

The shavings are collected in a small removable box, and the pencil is sharpened without soiling the hands, table or floor.

The Sharpener is made of metal, japanned, and is durable and ornamental.

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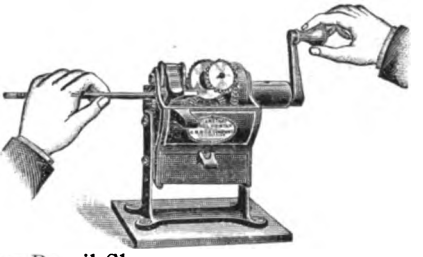
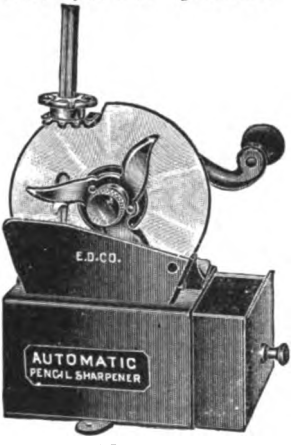
No. 3425.



No. 3425. Planetary Pencil Sharpener, ... Each, $4 50
3426. Extra Knives for Planetary Pencil Sharpener, . . " 65

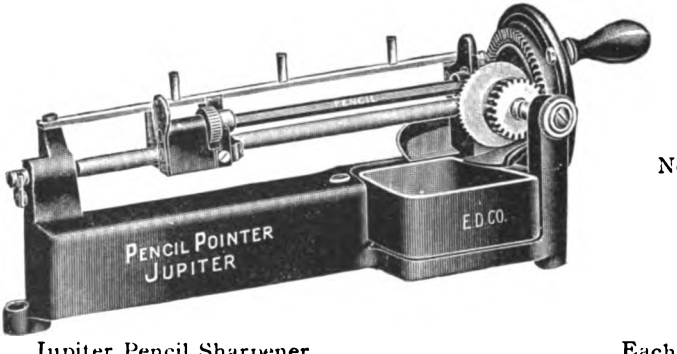
The Planetary Pencil Sharpener is made of cast metal, japanned, very durable and is easily operated, makes a perfect point on any size or kind of pencil; size, 6¼ × 5 × 4½ inches. Full directions with each machine.



No. 3427.

No. 3427. Automatic Pencil Sharpener, with two extra knives, Each, $4 40
3427½. Extra Knives, Per set of three, 60

The Automatic Pencil Sharpener is made of metal, japanned, of simple and durable construction, easily operated and will not break the point; size, 5 × 4 × 3½ inches. The pencil is held in position automatically; a perfect "working" point is obtained, and the operation is very rapid.



No. 3428.

No. 3428. Jupiter Pencil Sharpener, ... Each, $8 50

The Jupiter Pencil Sharpener is superior to all others in workmanship and the ease with which it can be operated. The cutting-wheel is made reversible, so that when one side becomes dull the other side may be used, after which a new cutting-wheel can be supplied or the old one sharpened.

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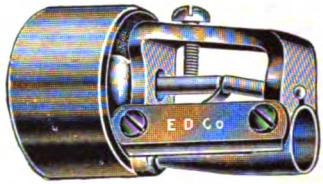
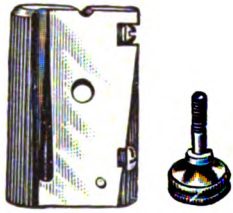
PENCIL SHARPENERS *Continued*

No. 3430.



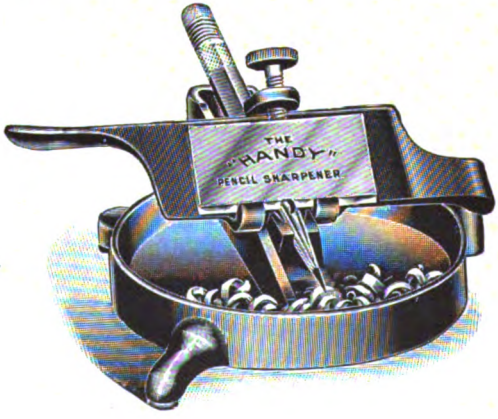
3434.

No. 3430. Spiro Pencil Sharpener, with ten cutting edges on one circular blade, ... Each, $0 45
3431. Extra Blades for Spiro Pencil Sharpener, ... " 15
3434. Duplex Pencil Sharpener, consists of a steel knife and emery-lined cup, ... " 50



No. 3437.

No. 3437. Acme Pencil Sharpener, with double edge reversible blade, held in place by thumb screw, ... Each, $0 25



No. 3438.

No. 3438. Handy Pencil Sharpener, ... Each, $1 00
3438½. Extra Blades for Handy Pencil Sharpener, . . . " 10

The operation is so easy and natural that it can be used by any one. The cutters are made of the best tool steel obtainable. When dull in one place the cutter may be shifted to a new position, thus using it nearly the entire length, and may be removed and sharpened. The base, which is a receptacle for the chips, rests on rubber tips which will not mar the desk.

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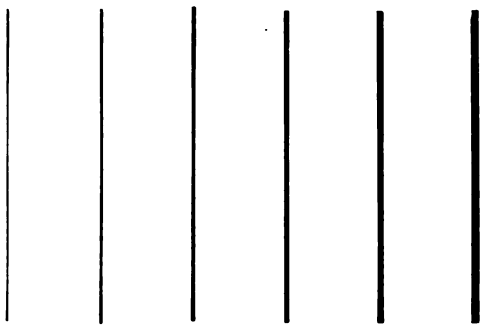
SHEPARD LETTERING PEN

Patented

FOR BLOCK LETTERS AND BORDER LINES



Nos. 1 2 3 4 5 6

Fac-simile of lines made with the six sizes of pens.

Advantages of the Shepard Lettering Pen

Simplicity of construction.
Ease and rapidity of operation.
Large ink-retaining cavity.
Uniformity of lines produced.
Quickness of cleaning.
Uniform ink flow.

There has been an increasing demand for a Lettering Pen with which Draftsmen, Architects, **Engineers** and Card Writers can quickly and neatly draw border lines or block letters, maintaining the strength and uniformity of the desired thickness of line throughout the entire drawing, and for this work the Shepard Lettering Pen has been designed.

It is of particular value for making letters, numbers or border lines, or for use on topographic contour drawings, which require lines of uniform thickness throughout the drawing. The operation is quickly mastered, block letters are formed at a single stroke, and the results obtained cannot be equaled by any other pen.

The Shepard Lettering Pen possesses the decided advantage over other forms of "ink reservoir" pens, in that it can be easily and quickly cleaned, and the construction of the pen points is such that the pen does not become *clogged*, a continuous and even flowing of the ink being insured.

No. 3439. Shepard Lettering Pen, German Silver, Nos. 1, 2, 3, 4, 5, or 6.
Each, ... $1 35

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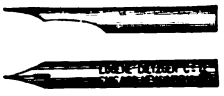
DIETZGEN STEEL PENS

Our Drawing and Lettering Pens, No. 3440 and Crow Quill Pens, No. 3442, were designed especially for draftsmen for drawing and lettering on drawing paper. For these purposes they will be found superior to other makes, as they have longer nibs and less sharp points, and possessing great elasticity, permit of more rapid work without scratching or catching on the grain of the paper.

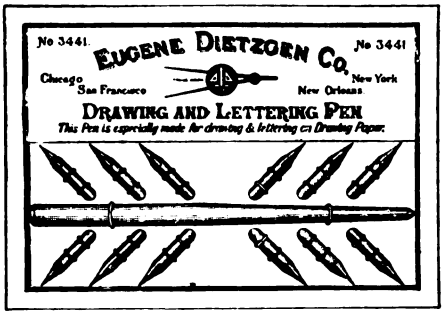
The Lithographic Pens, No. 3444, are especially made for drawing and lettering on lithographic stones. Having shorter, and consequently firmer nibs, with extra fine points, they are particularly adapted for that class of work.

No. 3440.



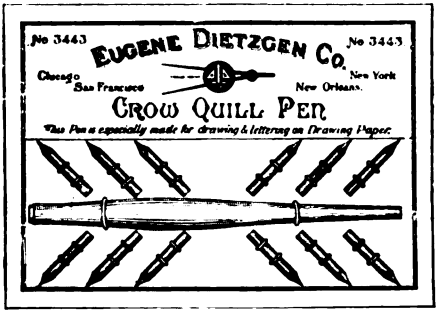
3442.

3444.



No. 3441.

No. 3440. Dietzgen Drawing and Lettering Pens, 1 doz. in box, Per doz., $0 50
3441. " " " " " 1 doz. No. 3440 on a card with holder, ... Per card, 60



No. 3443.

No. 3442. Dietzgen Crow Quill Pens, 1 doz. in a box, . . . Per doz., $0 50
3443. " " " " 1 doz. No. 3442 on a card with holder, ... Per card, 60

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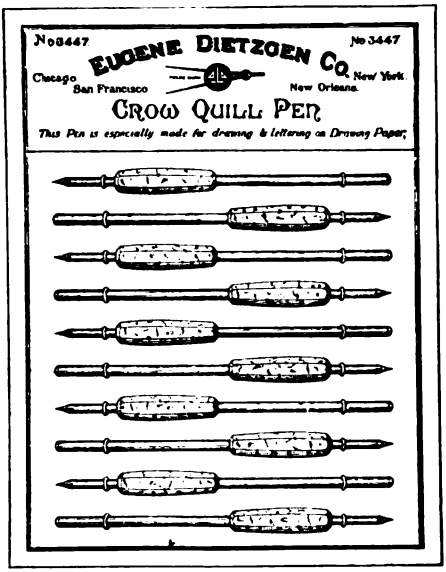
DIETZGEN STEEL PENS *Continued*

No. 3445.

No. 3444. Dietzgen Lithographic Pens, 1 doz. in a box, . Per doz., $0 50
3445. " " " 1 " No. 3444 on a card with holder, ... Per card, 60



No. 3447.

No. 3447. Dietzgen Crow Quill Pens, No. 3442, with improved holder having cork finger piece, 10 pens on card, each with holder.
Per card, ... $1 00
Each, ... 10

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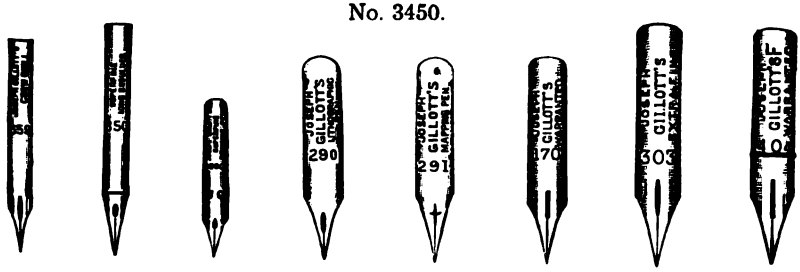
STEEL PENS

FOR LETTERING AND DRAWING.

No. 3450.



No. 3450. 3451. 3452. 3453. 3454. 3455. 3456. 3457.

			Per Dozen.	Per Gross.
No. 3450.	Gillott's Crow Quill Pens,	(659) on cards with holder,	$0 60	$6 00
3451.	" " " "	(850) Long Shoulder, on cards,	75	7 50
3452.	" Drawing "	(1000) Superfine, on cards, . .	1 10	12 00
3453.	" Lithographic "	(290) on cards, with holder, .	60	6 00
3453½.	" " "	(290) loose, in gross boxes, . .	50	5 00
3454.	" Mapping "	(291) on cards, with holder, .	60	6 00
3454½.	" " "	(291) loose, in gross boxes, . .	50	5 00
3455.	" " "	(170) " " " . .	10	1 00
3456.	" " "	(303) " " " . .	15	1 40
3457.	" " "	(404) " " " . .	10	1 00
3460.	French Crow Quill Pens, on cards, with holders, . .		35	3 60

PENHOLDERS

No. 3470.

No. 3470. Improved Crow Quill Penholder, without pen, . . . Each, $0 05
A holder for Crow Quill Pens of the thickness of an ordinary penholder.

No, 3473

		Each.	Per doz.
No. 3473.	Penholder, polished handle, for Nos 3453 to 3457,	$0 05	$0 40
3475.	" cork tip, for Nos. 3453 to 3457, . .	05	60

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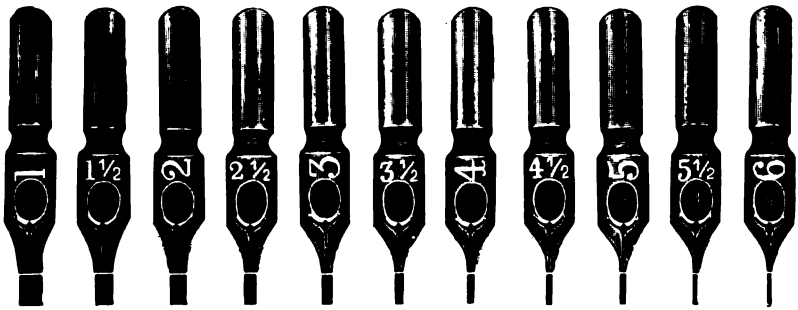
Round Writing

This beautiful style of writing can be easily acquired by self-instruction in a course of ten to twelve hours. Architects, engineers, draughtsmen cannot adopt a finer and more appropriate writing for lettering plans, maps, or other drawings.

Full directions, explaining the system of round writing, giving directions as to how to hold the pen, also examples to copy from, etc., are found in the Methodical Text Book, as listed under No. 3500.

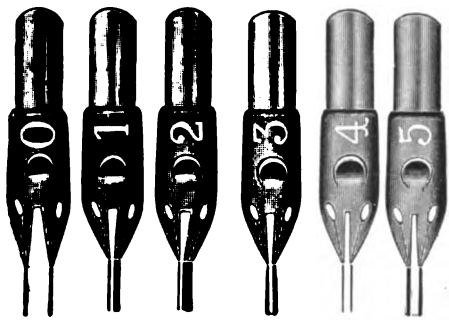
No. 3500. Methodical Text Book to Round Writing, ... Each, $0 75
3501. Round Writing Copy Book, without text, ... " 45



Nos. 1 1½ 2 2½ 3 3½ 4 4½ 5 5½ 6

Single Pointed Pens, Nos. 3509–3511.

No. 3509. Single Pointed Pens, ... Per ½ gross of any one size, $0 20
3510. " " " . . . . . Per " " " " " 70
3511. Assortment of 12 Single Pointed Pens on card, . . Per card, 12



Nos. 0 1 2 3 4 5

Double Pointed Pens, No. 3512.

No. 3512. Assortment of 12 Double Pointed Pens, 6 different kinds, on card with penholder, ... Per card, $0 25
3514. Assortment of Single and Double Pointed Pens, 25 in box, Per box, 40

No. 3515. 3520.

No. 3515. Inkholders for Single or Double Pointed Pens, . . Each, $0 05
3516. " " " " " Per box of 10, 40
3520. Penholder for Round Writing Pens, ... Each, 05

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LEONHARDT'S BALL POINTED PENS

No. 3540.

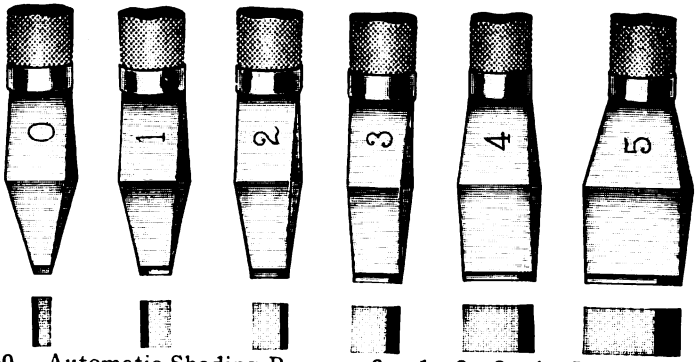
3542.

No. 3544.

3546.

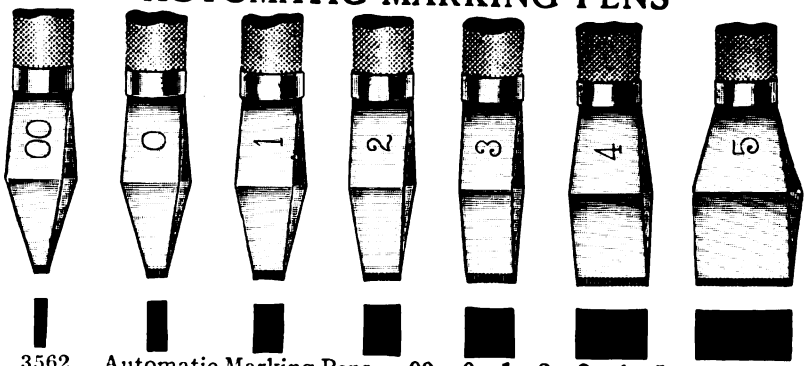
No. 3540.	Leonhardt's Ball Pointed Pens, 506F, . . .	Per gross.	$1 35
3542.	" " " " 506EF, . .	"	1 35
3544.	" " " " 516F, . .	"	1 35
3546.	" " " " 516EF, . .	"	1 35

AUTOMATIC SHADING PENS



No. 3560. Automatic Shading Pens, 0 1 2 3 4 5
Width of nib, ... 1/16 1/8 3/16 1/4 3/8 1/2 in., Each, $0 20

AUTOMATIC MARKING PENS



No. 3562. Automatic Marking Pens, 00 0 1 2 3 4 5
Width of nib, ... 1/16 3/32 1/8 3/16 1/4 3/8 1/2 in., Each, $0 20

No. 3565. Shading and Marking Pen Ink, in colors as follows:
Black, Dark Blue, Green, Purple, Scarlet, Yellow, Orange,
Dark Brown, ... Per 1 oz. bottle, 20

For Books on Lettering, Alphabet Books, etc., see Nos. 7500-7518.

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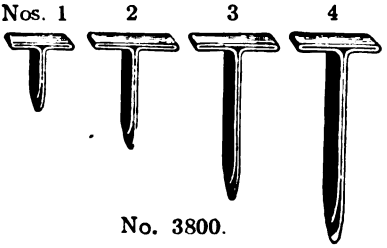
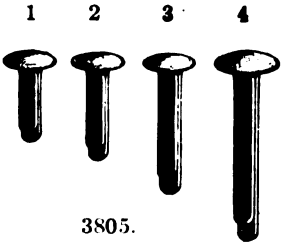
PAPER FASTENERS



No. 3800.



3805.

No. 3800.	Paper Fasteners, flat heads.				
	Number,	1	2	3	4
	Length,	¼	½	¾	1 in
	Per box of 100,	$0 15	20	25	30
3805.	Paper Fasteners, round heads.				
	Number,	1	2	3	4
	Length,	¼	½	¾	1 in.
	Per box of 100,	$0 20	25	30	40

PAPER CLIPS

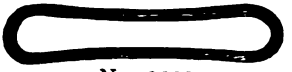
No. 3810.

3812.

3814.

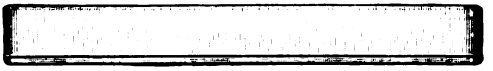
No 3810.	Clinch Clip, 250 in box,	Per box,	$0 12
3812.	Weis " 100 " "	"	12
3814.	Gem Clip, 100 " "	"	15

BEST RUBBER BANDS



No. 3820.

No. 3822.



No. 3824.

		Per ½-lb. box.
No. 3820.	Width, 1/16 in., In lengths as follows: 1¼, 1½, 2, 2½ in.,	$1 75
3822.	" 1/8 " " " " " " 1¼, 1½, 2, 2½, 3 in.,	1 75
3824.	" ¼ " " " " " 2, 2½, 3 in.,	1 75
3827.	Rubber Bands, width 1/16 in., assorted lengths,	1 75
3828.	" " " 1/8 " "	1 75
3829.	" " " ¼ " "	1 75
3830.	" " assorted widths and lengths,	1 75

Prices on Rubber Bands subject to change.

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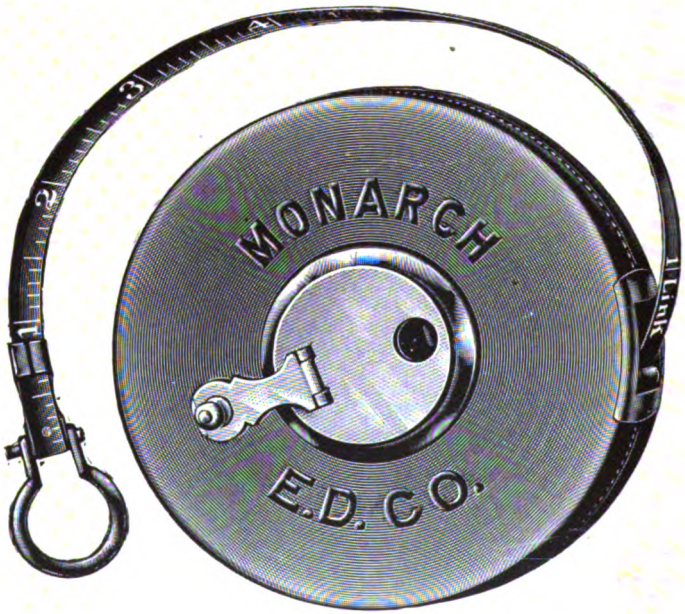
DIETZGEN STEEL MEASURING TAPES

We exercise extraordinary care in preparing and graduating our Tapes, and none but the finest grade of steel is used.

The standard of measurement for our full line of Tapes is furnished by the National Bureau of Standards at Washington, and the measurements on all steel tapes are guaranteed as near perfect accuracy as it is possible to make them. Numerous tests made during the last few years show that in comparison with tapes of other manufacture, our goods are the most accurate and reliable, and are recognized as such by the most prominent engineers and surveyors in different parts of the country.

MONARCH

Steel Ribbon ¼ inch wide.



No. 5002.

With hard leather metal lined cases, nickel-plated mountings, two detachable rings. The steel is heavier and stronger than used in the regular steel tapes, and the cases are thinner.

Monarch Steel Tapes, extra fine, Hard Leather Case, steel ribbon ¼ in. wide, flush handle. Graduations begin at end of line.

			Feet,	50	100
No. 5002.	Divided 10ths of feet and links, . .		Each,	$7 00	$12 00
5003.	" 12ths " " . .		"	7 00	12 00
			Meters,	15	30
5005.	" Metric and 12ths of feet, . .		Each,	8 50	15 00

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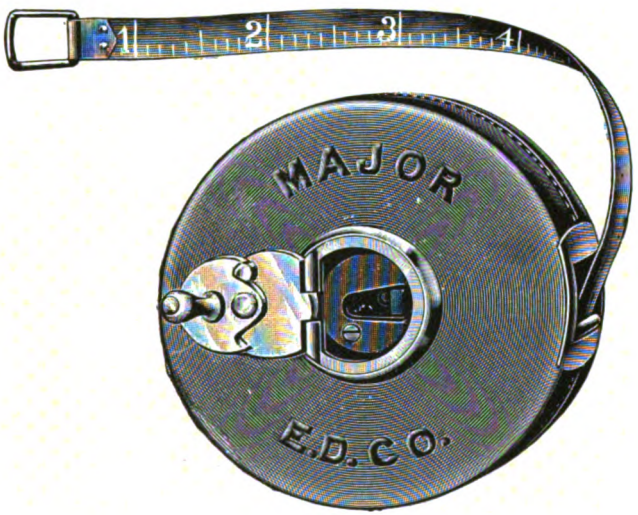
STEEL MEASURING TAPES *Continued*

MAJOR

Steel Ribbon 3/8 inch wide.



No. 5015.

Major Steel Tapes, Hard Leather Case, steel ribbon 3/8 in. wide, double folding flush handle opened by pressing small pin or button on opposite side, nickel-plated mountings. Graduations begin at end of ring.

		Feet,	25	50	75	100
No. 5015.	Divided 10ths of feet and links,	Each,	$4 50	7 25	10 50	13 00
5016.	" 12ths " " "	"	4 50	7 25	10 50	13 00
		Meters,	10		20	30
5018.	" Metric (one side only),	Each,	$5 00		9 00	13 00
5019.	" " and 12ths of feet,	"	6 00		10 50	15 50

Repairs on Steel Tapes of all kinds promptly attended to at moderate charges.

Tapes of other lengths or divisions made to order.

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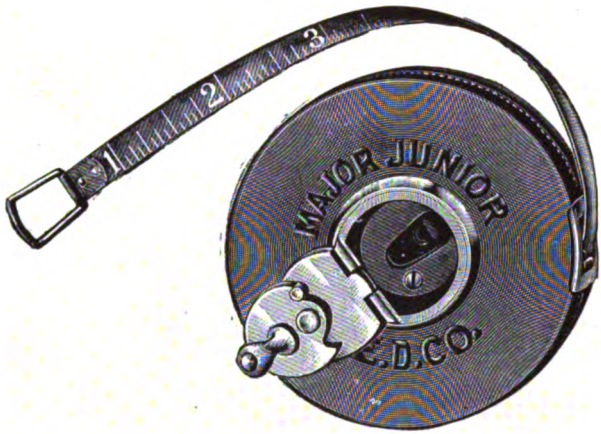
STEEL MEASURING TAPES *Continued*

MAJOR JUNIOR

Steel Ribbon ¼ inch wide.



No. 5027.

Our Major Junior Steel Tapes have a double folding flush handle, opened by pressing small pin or button on opposite side. A convenient Vest Pocket Steel Tape; 25 ft., weighs only 3 ounces; 50 ft. only 5 ounces, complete.

Major Junior Steel Tapes, Hard Leather Case, steel ribbon ¼ in. wide, double folding flush handle. Graduations begin at end of ring.

		Feet,	25	50	75	100
No. 5026.	Divided 10ths of feet, . . .	Each,	$4 00	5 00	6 25	7 75
5027.	" 12ths "	"	4 00	5 00	6 25	7 75
		Meters,	10	15		30
5028.	" Metric (one side only), .	Each,	$4 50	5 00		7 75
5029.	" " and 12ths of feet.	"	5 50	6 50		9 50

They are small and light, but constructed in such durable manner, and the steel of sufficient weight, that with proper care it will wear as long as an ordinary steel tape. It is, of course, not designed to replace or do the heavy work of a larger and heavier tape, but for such as have frequent use for a steel tape, and wish to have one constantly with them, this is an article of great value and convenience. Extreme accuracy and the finest construction is guaranteed.

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STEEL MEASURING TAPES *Continued*

CHESTERMAN'S

Steel Ribbon 3/8 inch wide.

No. 5032.

Chesterman's Steel Tapes, Red Leather Case, steel ribbon 3/8 in. wide, flush handle. Graduations begin at end of ring.

		Feet,	25	33	50	66	75	100
No. 5031.	Div. 10ths of feet and links,	Each,	$4 50	5 25	7 20	9 20	10 40	12 80
5032.	" 12ths " "	"	4 50	5 25	7 20	9 20	10 40	12 80

Repairs on Steel Tapes of all kinds promptly attended to at moderate charges.

Tapes of other lengths or divisions made to order.

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RELIANCE

Steel Ribbon 3/8 inch wide.

No. 5034B.

Reliance Steel Tapes, Hard Leather Case, steel ribbon ⅜ in. wide, flush handle. Graduations begin at end of ring.

		Feet,	25	50	75	100
No. 5034A.	Divided 10ths of feet, .	Each,	$3 50	4 50	5 75	7 25
5034B.	" 12ths " . . .	"	3 50	4 50	5 75	7 25
		Meters,	15		25	30
5034C	" Metric (one side only), .	Each,	$4 50		6 00	7 25
5034D.	" " and 12ths of feet, .	"	5 75		8 50	10 00

DEFENDER

Steel Ribbon ½ inch wide.

Defender Steel Tapes, Hard Leather Case, steel ribbon ½ in. wide, flush handle. Graduations begin at end of ring.

		Feet,	50	100
No. 5035A.	Divided 10ths of feet and links, . . .	Each,	$5 50	9 00
5035B.	" 12ths " " . . .	"	5 50	9 00

The Reliance and Defender Steel Tapes, while comparatively low in price, are strictly first class, durable, and the graduations guaranteed perfectly accurate.

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ATLAS

Steel Ribbon ¼ inch wide.

No. 5036A.

Atlas Steel Tapes, Hard Leather Case, flush handle, steel ribbon ¼ in. wide. Graduations begin at end of ring.

		Feet,	25	50	75	100
No. 5036A.	Divided 10ths of feet,	Each,	$3 25	4 00	5 00	6 25
5036B.	" 12ths "	"	3 25	4 00	5 00	6 25

The Atlas is about one-half the size and weight of our regular Reliance steel tape, the 25 ft. tape weighing about 3 oz.; 50 ft., about 5 oz.; other sizes in proportion. It is light and compact, yet constructed in a durable manner, and with proper care will last as long as any ordinary tape. To those who desire a tape for light work, one that can be conveniently carried in the pocket, the Atlas will prove specially attractive.

In workmanship these tapes are of unusual merit, and can be safely relied upon to give satisfaction in every particular.

Repairs on Steel Tapes of all kinds promptly attended to at moderate charges.

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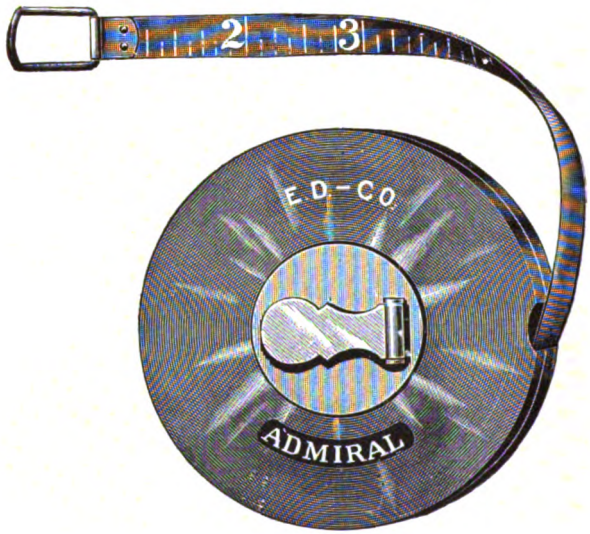
STEEL MEASURING TAPES *Continued*

ADMIRAL

In Nickel Plated Steel Cases. Steel Ribbon ⅜ inch wide.



No. 5037B.

Admiral Steel Tapes, Nickel Plated Steel Case, flush handle, steel ribbon ⅜ in. wide. Graduations begin at end of ring.

		Feet,	25	50	75	100
No. 5037A.	Divided 10ths of feet, . .	Each,	$2 90	3 75	5 00	6 50
5037B.	" 12ths " . .	"	2 90	3 75	5 00	6 50
		Meters,	15	25		30
5037C.	" Metric (one side only), . .	Each,	$3 75	5 75		6 50
5037D.	" " and 12ths of feet, .	"	5 00	8 00		9 00

The Admiral Steel Tapes are manufactured by us to meet the demand for a low-priced steel tape, and are intended to supersede the metallic tapes, which are frequently used when a more reliable tape ought to be employed. The graduations are guaranteed accurate and the nickel-plated steel case is compact and very durable.

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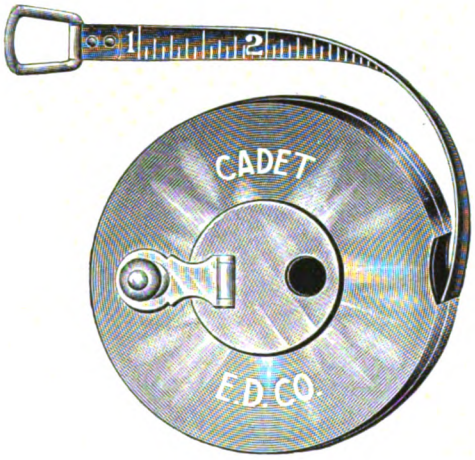
STEEL MEASURING TAPES *Continued*

CADET

In Nickel Plated Steel Cases. Steel Ribbon ¼ inch wide.



No. 5038B.

Cadet Steel Tapes, Nickel Plated Steel Case, flush handle, steel ribbon ¼ in. wide. Graduations begin at end of ring.

		Feet,	25	50	75	100
No. 5038A.	Divided 10ths of feet,	Each,	$2 75	3 50	4 50	5 50
5038B.	" 12ths "	"	2 75	3 50	4 50	5 50

The Cadet is designed to meet the demand for a light, serviceable tape at a moderate price. It is made on the same general lines as our Admiral steel tape, but is not much over half its size and weight. The 25 ft. weighs about 3½ oz.; 50 ft., 5½ oz.; and other sizes in proportion.

Durability has not, however, been sacrificed in obtaining the above features, as the tapes are constructed in such a manner that with proper care they will last as long as any ordinary steel tape. In workmanship, they present a nicely finished appearance. Accuracy guaranteed.

Tapes of other lengths or divisions made to order.

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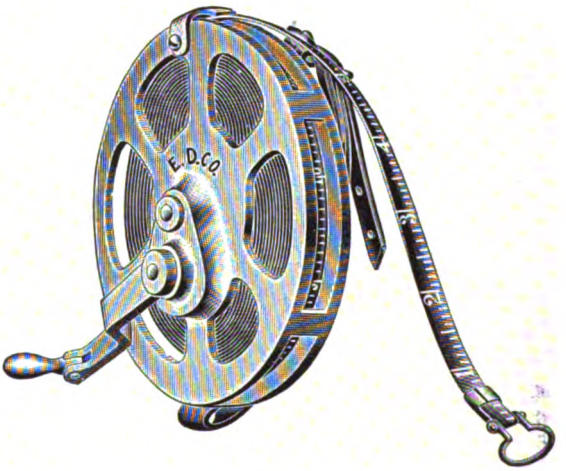
THE "IDEAL RAPID WINDING" TAPE REEL

For 100 Foot Etched Steel Tapes.



No. 5040.

The "Ideal Rapid Winding" Tape Reel is 5¼ inches in diameter, and weighs but 10 ounces. The frame is of aluminum alloy, and is strong and durable; the wearing parts are hard steel, and the handle bronze.

The construction is unique: A high speed gear and long flush folding handle enables the tape to be *quickly and easily wound*, making it of value for city work, as by quick winding the breaking of the tape by passing vehicles is avoided; *100 feet of tape can be wound in about 12 seconds.* By means of a strong brake, the unreeling of the tape can be checked at any desired point, and with but little effort held perfectly rigid. The drum is of large diameter, thus increasing the life of the tape; the gear case is dust-proof. Each reel is provided with an adjustable leather handle.

No. 5039. "Ideal Rapid Winding" Tape Reel, for 100 ft. etched steel tapes, ¼ or ⅜ inches wide, ... Each, **$ 7 50**

5040. "Ideal Rapid Winding" Tape Reel, with 100 ft. highest quality etched steel tape, ¼ in. wide, divided 10ths of feet, with two detachable handles for tape, . . . Each, **14 00**

The above Reel is not intended for use with Chain Tapes.

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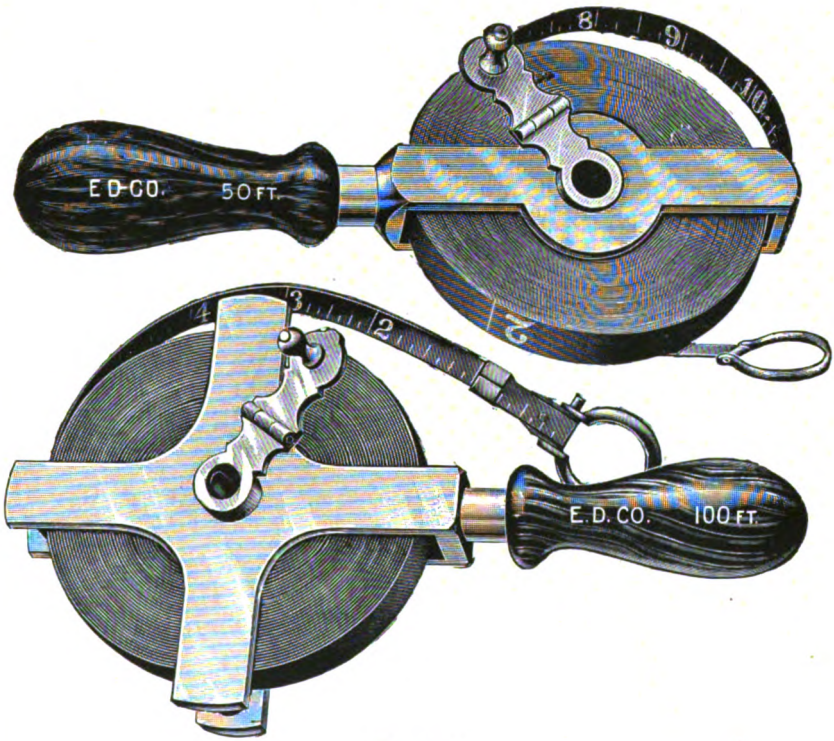
STEEL MEASURING TAPES *Continued*

CHANCELLOR

Steel Ribbon ¼ inch wide.



No. 5042.

Chancellor Steel Tapes, steel ribbon ¼ in. wide, nickel-plated brass frame and mountings, with folding handle. Two detachable rings. Graduations begin at end of line.

		Feet,	50	100	200
No. 5041.	Divided 10ths of feet and links,	Each,	$6 00	10 00	19 00
5042.	" 12ths " "	"	6 00	10 00	19 00
		Meters,	15	30	50
5042C.	" Metric (one side only),	Each,	$6 00	10 00	16 50
5042D.	" " and 12ths of feet,	"	7 25	12 50	19 50

Four-arm frames furnished with above 100 feet, 200 feet, 30 and 50 meter Tapes.

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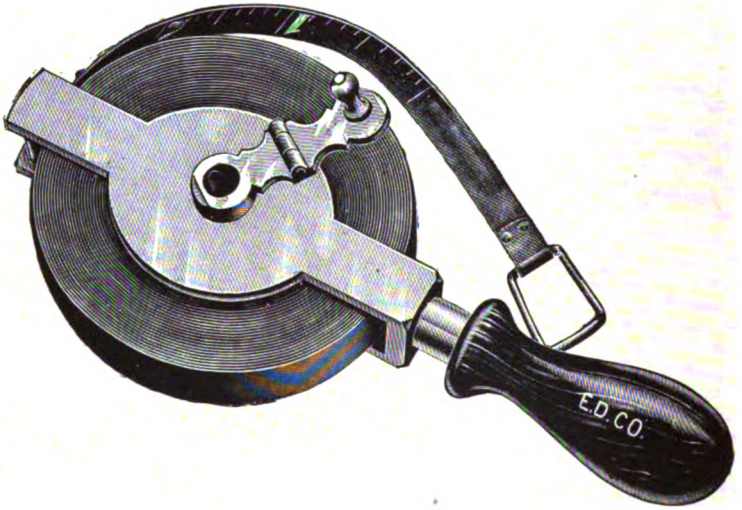
STEEL MEASURING TAPES *Continued*

REGAL

Steel Ribbon 3/8 inch wide.



No. 5043A.

Regal Steel Tapes, steel ribbon 3/8 in. wide, nickel-plated brass frame and mountings, with folding handle. Graduations begin on the line.

		Feet,	50	100	150	200
No. 5043A.	Divided 10ths of feet,	Each,	$5 00	8 50	13 50	17 00
5043B.	" 12ths "	"	5 00	8 50	13 50	17 00

Four-arm frames furnished with above 150 and 200 feet Tapes.

MAJESTIC

Steel Ribbon 1/2 inch wide.

Majestic Steel Tapes, steel ribbon 1/2 in. wide, nickel-plated brass frame and mountings, with folding handle. Two detachable rings. Graduations begin on the line.

		Feet,	50	100
No. 5044.	Divided 10ths of feet, ...	Each,	$6 00	10 00
5045.	" 12ths "	"	6 00	10 00

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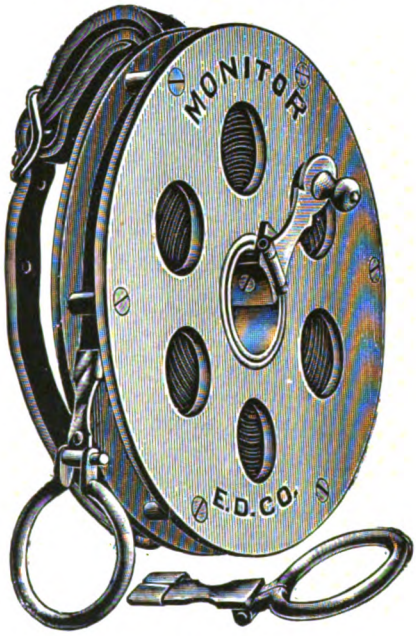
STEEL MEASURING TAPES *Continued*

MONITOR

Steel Ribbon 1/4 inch wide.



No. 5047.

Monitor Steel Tapes, with metal reel and leather strap handle and two detachable handles for tape line, steel ribbon 1/4 in. wide. Graduations begin on the line.

		Feet,	50	100
No. 5047.	Divided 10ths of feet, ...	Each,	$8 00	12 75
		Meters,	15	30
5048.	" Metric (one side only), . . .	Each,	$8 00	12 75

STEEL POCKET TAPES

For Reading Diameter from Circumference.

No. 5049. Steel Pocket Tape, German Silver Case, with spring and stop, 12 feet, steel ribbon 1/4 in. wide, ... Each, $3 25

This tape is graduated to inches and $\frac{1}{8}$ in. on one side, and on the other side to a scale of 3.1416 in.=1 inch, for computing the diameter. The graduations are numbered from zero up, the one before zero being subdivided into 64 equal parts so that the diameter can be read to inches and $\frac{1}{64}$ inches.

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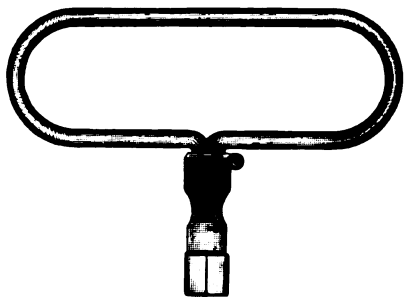
HANDLES FOR STEEL TAPES

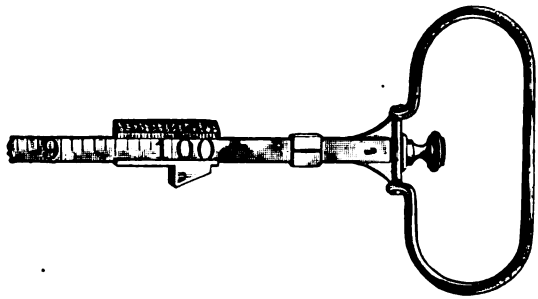
No. 5049A.



5049B.

No. 5049A. Plain Detachable Handles, for ¼ in. tapes, small, 1 in., round, ... Per pair, $0 50

5049B. Plain Detachable Handles, for ¼ in. tapes, large, 3 in. oval, Per pair, ... 1 00



No. 5049F.

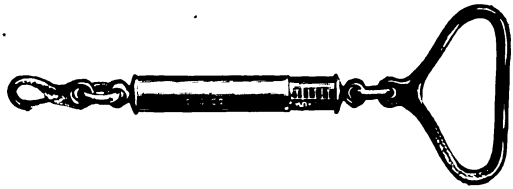
No. 5049E. Compensatory Handles for various temperatures, for ¼ in. tapes 50 ft. long, ... Per pair, $2 00

5049F. Compensatory Handles for various temperatures, for ¼ in. tapes 100 ft. long, ... Per pair, 2 00

A pair of Compensatory Handles consists of one compensatory handle as shown under No. 5049F, and one large plain handle, No. 5049B.

TENSION HANDLES

For Engineers' Steel Tapes.



No. 5049K.

No. 5049K. Tension Handle, brass, nickel-plated, indicating tension up to 15 lbs., reading to half pounds, ... Each, $2 50

5049L. Tension Handle, like No. 5049K, but indicating tension up to 25 lbs., reading to half pounds, ... Each, 2 50

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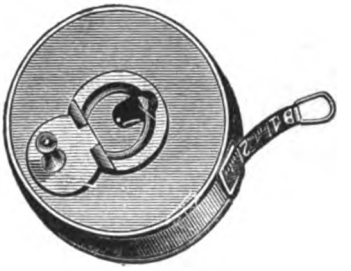
MAJOR POCKET TAPES

STEEL AND LINEN



Nos. 5050-5052.

Major Steel Pocket Tapes, German silver case, 2⅛ in. diam., flush handle; neat, compact and very handy; steel ribbon $\frac{5}{16}$ in. wide.

No. 5050.	Divided 10ths of feet, 25 feet long, ...	Each,	$3 60
5051.	" 12ths " 25 " "	"	3 60
5052.	" 10ths and 12ths of feet, 25 feet long, . .	"	4 00

No. 5061.

Major Steel Pocket Tapes, German silver case, with spring and stop; steel ribbon ½ in. wide.

		Feet,	3	5	6	9	12
No. 5061.	Divided $\frac{1}{16}$ in. and metric,	Each.	$1 10	1 40	1 60	2 20	2 80
5062	" $\frac{1}{100}$ ft. " $\frac{1}{16}$ in.,	"	1 30		1 90		3 00

Major Linen Pocket Tapes, German silver case, with spring and stop.

		Feet,	3	6
No. 5065.	Divided ⅛ in. and metric, ...	Each,	$0 80	1 05

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MIDGET STEEL POCKET TAPES

Nos. 5075-5078.

Midget Steel Pocket Tapes, nickel-plated brass case, spring wind with center stop, steel ribbon ¼ in. wide.

		Inches, 36	60	72	96
No. 5075.	Divided $\frac{1}{16}$ in. (one side), . Each,	$0 70	90	1 00	1 50
5077.	" $\frac{1}{16}$ " and metric (both sides), Meters,	1	1½		2
	Each, ...	$0 80	1 10		1 20
5078.	Divided $\frac{1}{16}$ in. (one side), ¼ in. to foot (other side), 60 in. long, ... Each,		$0 90		

The No. 5078 Tape will be found especially convenient for Architects' and Contractors' use. Distances on large drawings made to ¼ inch scale can be laid off or measured in one operation, thus saving time and avoiding the errors which result from the shifting of the ordinary short scales.

It is sub-divided its entire length on both sides, and with the ¼-inch scale any distance from 1 to 240 feet can be quickly and accurately measured.

IDEAL STEEL POCKET TAPES

LEATHER CASES.

No. 5080

Ideal Steel Pocket Tapes, best quality Leather Case, metal lined, spring wind with center stop, silver-plated mountings, steel ribbon ¼ in. wide.

No. 5080.	Divided $\frac{1}{16}$ in. (one side), 60 in. long, ... Each,	$1 75
5082.	" $\frac{1}{16}$ " and $\frac{1}{100}$ ft. (both sides), 60 in. long, "	2 00
5084.	" $\frac{1}{16}$ " and metric (both sides), 60 in. long, "	2 00

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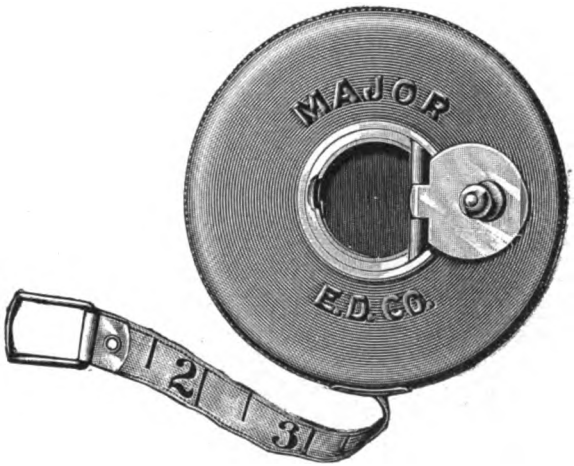
DIETZGEN METALLIC MEASURING TAPES

These Tapes are made of linen thread, interwoven with fine brass wire, and are not so liable to stretch as the ordinary linen tape, and better calculated to withstand the effect of moisture. **Where exact measurements are required, only Steel Tapes should be used.**



No. 5120.

Major Metallic Tapes, Red Leather Case, ⅝ in. wide. Best wire woven or metallic, flush handle, leather end. Graduations begin at end of ring.

			Feet, 50	100
No. 5120.	Divided	10ths of feet and links, ...	Each, $2 30	3 80
5121.	"	12ths " "	" 2 30	3 80
			Meters, 15	30
5122C.	"	Metric (one side only), ...	Each, $2 30	3 80
5122D.	"	" and 12ths of feet, . . .	" 2 40	4 00

Major Metallic Tapes, *without case.*

			Feet, 50	100
No. 5123.	Divided	10ths of feet and links, ...	Each, $1 35	2 60
5124.	"	12ths " "	" 1 35	2 60
			Meters, 15	30
5125.	"	Metric (one side only), ...	Each, $1 20	2 40
5126.	"	" and 12ths of feet, . . .	" 1 35	2 60

ALL LINEN MEASURING TAPES

Major All-Linen Tapes, Red Leather Case, ⅝ in. wide, flush handle, leather end. Graduations begin at end of ring.

			Feet, 50	100
No. 5127.	Divided	10ths of feet and links, ...	Each, $2 75	4 50
5128.	"	12ths " " . . .	" 2 75	4 50

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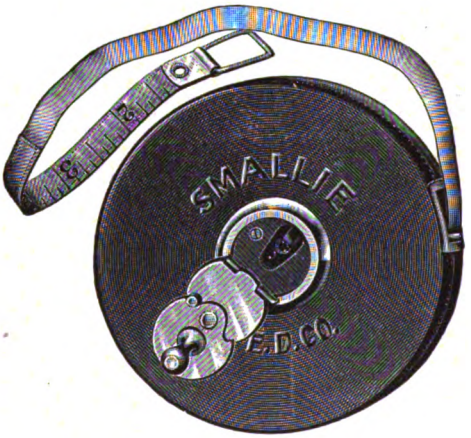
METALLIC MEASURING TAPES *Continued*

SMALLIE



No. 5129B.

Smallie Metallic Tapes, Hard Leather Case, ⅜ in. wide, wire woven or metallic, double folding flush handle, opened by pressing small pin or button on opposite side, leather end. Graduations begin at end of ring.

		Feet,	25	50
No. 5129A.	Divided 10ths of feet, . . .	Each,	$1 85	2 35
5129B.	" 12ths " "	"	1 85	2 35

The Smallie Metallic Tapes are less than one-half the size and weight of regular Metallic Tapes. Diameter of case for the 25 foot length, 2¾ in., 50 foot, 3½ in.

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COLUMBIA

No. 5130A.

Columbia Metallic Tapes, Hard Leather Case, ⅝ in. wide, wire woven or metallic, folding handle, leather end. Graduations begin at end of ring.

		Feet,	25	50	75	100
No. 5130A.	Divided 10ths of feet and links,	Each,	$1 80	2 60	3 30	4 20
5130B.	" 12ths " " "		1 80	2 60	3 30	4 20

Columbia Metallic Tapes, ***without case.***

		Feet,	25	50	75	100
No. 5130C.	Divided 10ths of feet and links,	Each,	$1 00	1 50	2 00	2 90
5130D.	" 12ths " " "		1 00	1 50	2 00	2 90

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METALLIC MEASURING TAPES *Continued*

CHESTERMAN'S

No. 5131.

Chesterman's Metallic Tapes, Red Leather Case, ⅝ in. wide, wire woven or metallic, folding handle. Graduations begin at end of ring.

		Feet,	25	33	50	66	75	100
No. 5131.	Div. 10ths of feet and links,	Each,	$1 80	2 10	2 60	3 00	3 30	4 20
5132.	" 12ths " " "		1 80	2 10	2 60	3 00	3 30	4 20

Chesterman's Metallic Tapes, ***without case.***

		Feet,	25	50	66	100
No. 5141.	Divided 10ths of feet and links,	Each,	$1 00	1 50	2 00	2 90
5142.	" 12ths " " "		1 00	1 50	2 00	2 90

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DIETZGEN FLAT STEEL WIRE TAPES

FOR CITY, BRIDGE, MINE AND RAILROAD ENGINEERING

These Tapes are made of the finest quality of flexible steel ribbon ⅛ in. wide, carefully tempered to prevent breaking or kinking. We make these Tapes regularly from 100 feet up to 500 feet in length, but can also furnish them up to 1,000 feet if desired. We are also prepared to furnish these Tapes with steel ribbon about $\frac{1}{16}$ in. wide if so ordered, at the same prices as for the corresponding ⅛ in. Tapes. Each Tape is provided with two nickel-plated detachable handles.

They are graduated under a strain of ten pounds avoirdupois, supported throughout, and compare accurately with the Government Standard at 62° Fahrenheit.

Our Flat Steel Wire Tapes are made in two styles: Nos. 5400 to 5424 are of ⅛ in. black steel ribbon, graduated on *clamped brass sleeves* which are notched exactly opposite the graduation mark. Nos. 5430 to 5454 are made of ⅛ in. steel ribbon, *heavily plated with white metal* (to resist rust), and are graduated on *tubular brass sleeves* carefully spaced and soldered. This method of fastening prevents corrosion. The ends of both style sleeves are beveled to facilitate dragging the Tape through brush, grass, etc. without catching.

These Tapes are guaranteed to be of correct length, but parties desiring to have them verified can have this done by sending the Tape to the National Bureau of Standards, Washington, D. C. The Bureau's fee for comparing the total length not greater than 100 feet is 75 cents, and for each intermediate division compared an additional charge of 10 cents is made. Transportation charges to Washington must be prepaid.

Flat Steel Wire Tapes graduated in Links, Varas, or other measure furnished to order on short notice.

Reels are listed separately (see Nos. 5475-5490) and are not included in the prices of these Tapes.

10 20

Graduations on clamped brass sleeves.

Flat Steel Wire Tapes, black ribbon 1/8 ***in. wide, graduated on clamped brass sleeves,*** with 2 nickel-plated detachable handles.

		Without Reel Each.
No. 5400.	100 feet, graduated every foot, end feet in 10ths, . . .	$ 7 50
5401.	200 " " " " " " "	13 00
5404.	200 " graduated every 5 ft., end 5 ft. every ft., end ft. in 10ths,	9 00
5405.	300 " " " 5 " " 5 " " " "	12 00
5406.	400 " " " 5 " " 5 " " " "	15 00
5407.	500 " " " 5 " " 5 " " " "	18 00
5410.	200 " graduated every 10 ft., end 10 ft. every ft., end ft. in 10ths,	7 00
5411.	300 " " " 10 " " 10 " " " "	9 00
5412.	400 " " " 10 " " 10 " " " "	11 00
5413.	500 " " " 10 " " 10 " " " "	13 00
5415.	200 " graduated every 25 feet, end 25 feet to 5 feet, end 5 feet every foot, end feet in 10ths, . . .	6 50
5416.	300 " " like No. 5415, ...	8 00
5417.	400 " " " " 5415, ...	9 50
5418.	500 " " " " 5415, ...	11 00
5420.	30 meters, graduated every meter, end meters to decimeters,	7 00
5422.	50 " " " " " " " "	10 50
5424.	100 " " " " " " " "	17 50

Reels for above Tapes listed under Nos. 5475-5490.

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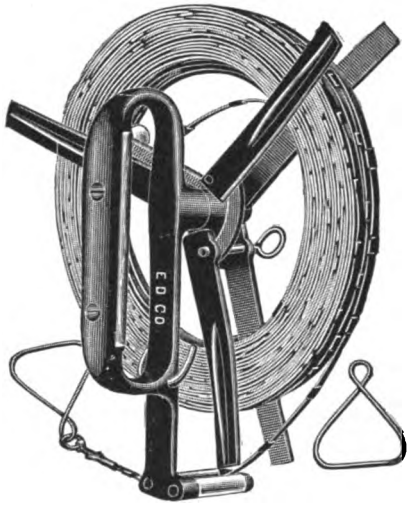
FLAT STEEL WIRE TAPES *Continued*



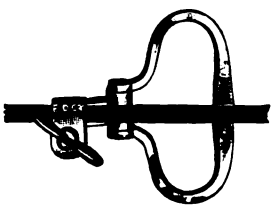
No. 5430 Tape with No. 5480 Reel.

Graduations on tubular brass sleeves.

Flat Steel Wire Tapes, steel ribbon 1/8 ***in. wide, heavily plated with white metal*** (to resist rust), ***graduated on tubular brass sleeves*** carefully soldered, with 2 nickel-plated detachable handles.

			Without Reel Each.
No. 5430.	100	feet, graduated every foot, end feet in 10ths,	$12 50
5431.	200	" " " " " " " " " "	24 00
5434.	200	" graduated every 5 ft., end 5 ft. every ft., end feet in 10ths,	17 00
5435.	300	" " " 5 " " 5 " " " " "	23 00
5436.	400	" " " 5 " " 5 " " " " "	28 50
5437.	500	" " " 5 " " 5 " " " " "	34 00
5440.	200	" graduated every 10 ft., end 10 ft. every ft. end ft. in 10ths,	13 00
5441.	300	" " " 10 " " 10 " " " " "	16 50
5442.	400	" " " 10 " " 10 " " " " "	20 00
5443.	500	" " " 10 " " 10 " " " " "	23 50
5445.	200	" graduated every 25 feet, end 25 feet to 5 feet, end 5 feet every foot, end feet in 10ths,	11 00
5446.	300	" " like No. 5445,	13 50
5447.	400	" " " " 5445,	16 00
5448.	500	" " " " 5445,	18 50
5450.	30	meters, graduated every meter, end meters to decimeters,	12 00
5452.	50	" " " " " " " " "	18 00
5454.	100	" " " " " " " " "	32 50

Reels for above Tapes, listed under Nos. 5475-5490.



No. 5470. Clamping Handle for narrow tapes, to attach to any part of tape, of brass, nickel-plated, ... Each, **$0 75**

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STANDARD FOR CITY, BRIDGE, RAILROAD AND MINING ENGINEERING

ENGINEERS' STANDARD STEEL TAPES

(Not Subdivided)

No. 5472.

No. 5472. Engineers' Standard Steel Tape, 50 feet long, $\frac{5}{32}$ in. wide, made of highest grade steel, adjustable for variations in temperature, with improved spring balance, level and thermometer, two nickel-plated handles, with solid brass nickel-plated reel, ... Each, $18 00

5473. Engineers' Standard Steel Tape, like No. 5472, but 100 feet, ... Each, 21 00

This Tape has no intermediate graduations and measurements can be taken by its entire length only. The combination spring balance and compensating handle is partly included in the measure; the terminals of the measure are indicated by a V-shaped groove on a brass sleeve at one end of the steel tape, and a V-shaped groove cut into the clamping ring of the spring balance and compensating handle. The combination spring balance and compensating handle is made of two telescoping nickel tubings which are connected by a strong concealed spring. One end of the outer tube embraces the thermometer, which is protected by a revolving tubular cover, while at the other end the degrees Fahrenheit for compensation are marked; the inner tube is provided with a spirit level and the tension marks of the spring balance, and carries at its outer end the handle for holding the combination spring balance. The outer tube is encircled by a split sleeve and a knurled clamping ring into which is cut the V-shaped groove; this split sleeve is used for adjusting the length of the tape, by bringing the sleeve with the V-shaped groove to the index mark on the compensating scale, which corresponds with the degree Fahrenheit as read on the thermometer.

Directions for use: Adjust the handle for contraction and expansion by bringing the sleeve to a position on the compensating scale corresponding with the reading of the thermometer, then bring the V-shaped groove of the brass sleeve at the other end of the tape over the point to be measured from by suspending a plumb bob from this groove; the tension is then adjusted by pulling the tension handle until the tension marks of the inner and outer tubes coincide, care being taken that the tape line and combination handle are level, which will be observed by the spirit level in the tubing. Suspend another plumb bob from the V-shaped groove of the combination handle, and the plumb bob point will indicate the other terminal point of the measurement.

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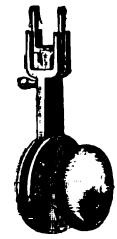
REELS FOR FLAT WIRE AND CHAIN TAPES

No. 5475.



5475 (Folded).

No. 5475. Folding Brass Reel, for tapes 100 ft. long, . . . Each, $2 00
5477. " " " " " 200 to 300 ft. long, . " 3 50

No. 5480.

5480 (Folded).

No. 5480. Folding Brass Reel, for tapes 100 to 300 ft. long, . Each, $4 50
5481. " " " like No. 5480, but for tapes 400 to 500 ft. long, ... Each, 5 00

No. 5483.

No. 5483. Improved Phosphor Bronze Reel, with grip handle and leather strap to fit around arm of chainman, for tapes 200 to 500 ft. long. Friction brake and stop to hold tape at any point. Especially adapted for railroad and bridge work; weight about 4 pounds, ... Each, $11 00
5485. Improved Reel, like No. 5483, but made of aluminum, " 13 50

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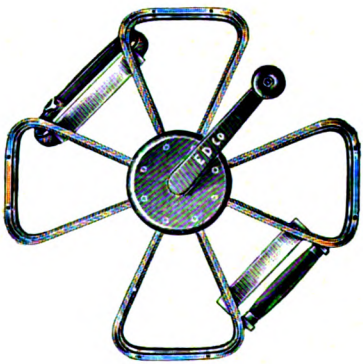
REELS FOR FLAT WIRE AND CHAIN TAPES *Continued*

No. 5488.

No. 5488. Wooden Reel, built-up hardwood, very substantial. The wooden frame revolves on a metal center. Bolts are nickel-plated and all wooden parts are polished, for tapes 100 to 500 ft. long, ... Each, $7 00



No. 5490.

No. 5490. Superior Metal Reel, for tapes 300 to 600 ft. long, . Each, $11 50

This Reel is substantially built, and on account of being exceedingly strong, it is especially serviceable for long tapes and hard usage. The arrangement of the metal arms permits winding of the line without kinking and allows free circulation of air for rapid drying and cleaning.

Handles for Steel Tapes, listed under Nos. 5049A—5049L.

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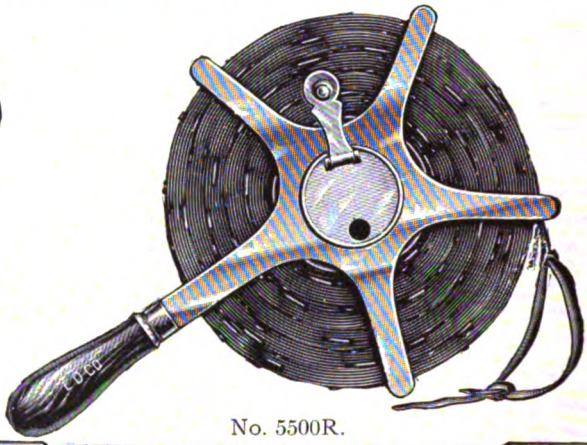
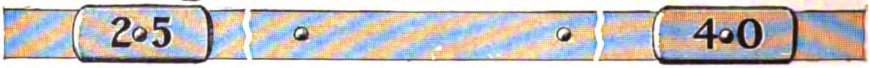
PREMIER STEEL CHAIN TAPES

No. 5524.



No. 5500R.



Graduations on Premier Chain Tapes.

These Chain Tapes are made of superior polished steel, about 1/4 ***in. wide, graduated every foot by a brass rivet,*** end feet in 10ths and the number of feet are stamped on brass plates every 5 feet.

The Metric Tapes are graduated by rivets every quarter-meter, end meters in decimeters, and are numbered at every meter.

Each Tape is provided with a pair of detachable rawhide handles, but if desired, two plain detachable metal handles will be furnished. The reel is of very substantial construction, made of brass, nickel-plated, with polished wooden handle. For country, field and town work these tapes have given excellent satisfaction. They can be dragged through woodland, brush, etc., and the plated tapes resist rusting better.

Plain Blued Steel Ribbon, 1/4 in. wide.

No. 5500N.	100 feet long, without reel,	Each,	$3 00
5500R.	100 " " with reel No. 5528,	"	5 00
5503N.	200 " " without reel,	"	5 00
5503R.	200 " " with folding reel No. 5480,	"	9 50
5505N.	100 links " without reel,	"	3 00
5505R.	100 " " with reel No. 5528,	"	5 00

Plated Steel Ribbon, 1/4 in. wide.

No. 5511N.	100 feet long, without reel,	Each,	$ 4 00
5511R.	100 " " with reel No. 5528,	"	6 00
5517N.	200 " " without reel,	"	6 00
5517R.	200 " " with folding reel No. 5480,	"	10 50
5519N.	300 " " without reel,	"	8 00
5519R.	300 " " with folding reel No. 5481,	"	13 00
5520N.	100 links " without reel,	"	4 00
5520R.	100 " " with reel No. 5528,	"	6 00
5522N.	30 meters " without reel,	"	4 00
5522R.	30 " " with reel No. 5528,	"	6 00
5523N.	50 " " without reel,	"	5 00
5523R.	50 " " with folding reel No. 5480,	"	9 50
5524.	Plain Detachable Metal Handles,	Per pair,	35
5526.	Rawhide Handles,	" "	25
5528.	Reel only,	Each,	2 00

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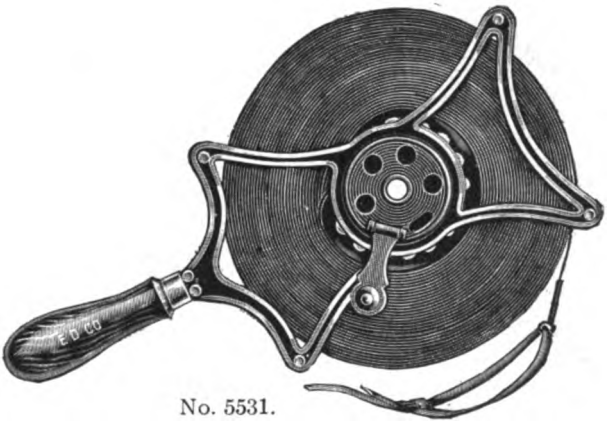
INDESTRUCTIBLE STEEL CHAIN TAPES



No. 5531.

Graduations on Indestructible Chain Tapes.

These Chain Tapes are made of extra tough material, the steel ribbon being about 5/16 ***in. wide*** and somewhat heavier than the ordinary Chain Tapes. They are ***graduated and numbered at every foot on Babbitt Metal***, end feet in 10ths, and are plated with white metal to resist rust. The Metric Tapes are graduated every quarter-meter, end meters in decimeters.

On account of the unusual dimensions of this Tape it requires intentional carelessness to break or permanently bend it. They are well adapted for use in mines, and on rough ground the divisions are less liable to injury than rivets or plates. Each Tape is provided with a pair of detachable rawhide handles, but if desired, two plain detachable metal handles will be furnished. The plain Reel is made of brass, of very substantial construction, with polished wooden handle.

No. 5530.	100 feet long, without reel,	Each,	$ 4 25
5531.	100 " " with plain reel No. 5543,	"	6 00
5532.	200 " " without reel,	"	6 50
5533.	200 " " with folding reel No. 5480,	"	11 00
5534.	300 " " without reel,	"	8 75
5535.	300 " " with folding reel No. 5481,	"	13 75
5537.	30 meters " without reel,	"	4 25
5538.	30 " " with plain reel No. 5543,	"	6 00
5539.	50 " " without reel,	"	5 50
5540.	50 " " with folding reel No. 5480,	"	10 00
5543.	Plain Reel only,	"	1 75

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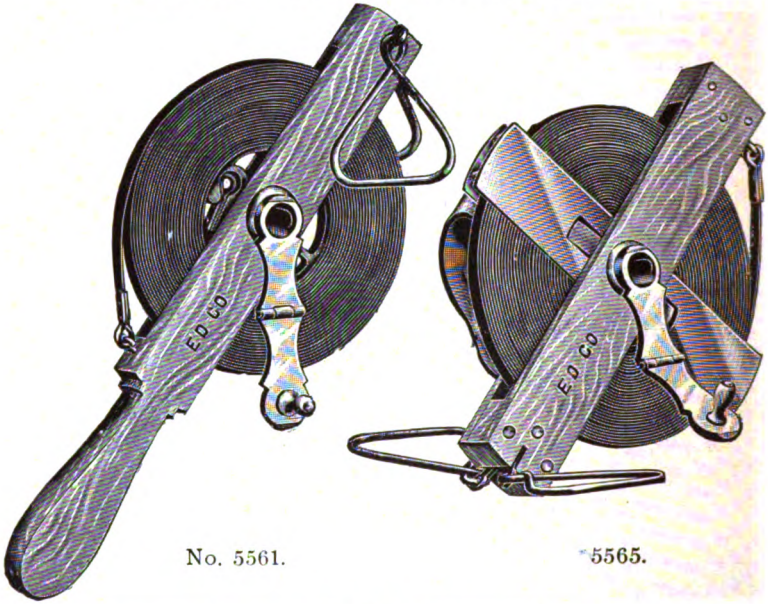
EMPIRE STEEL CHAIN TAPES



No. 5561. 5565.

Graduations on ¼ in. Empire Chain Tapes.

These Tapes are made of best quality of tempered steel, about 1/4 ***in. wide***, with ***etched graduations at every foot***, end feet in 10ths. Each tape is provided with two detachable metal handles, and is furnished with or without reel, as desired.

The plain Reel is made of hardwood, with large metal folding handle, nickel-plated trimmings. The folding Reel has steel cross-arms and a strong leather loop fastened to one side of the frame for holding. When tape is in use and removed from the reel, the metal cross-arms of the reel can be folded into the wooden frame, so that even the large sizes can be conveniently carried in the pocket.

No. 5560.	100 feet long,	without reel,	Each, $ 4 50
5561.	100 " "	with plain reel No. 5574,	" 7 00
5562.	100 " "	" folding reel No. 5578,	" 8 50
5563.	200 " "	without reel,	" 7 50
5564.	200 " "	with plain reel No. 5574,	" 10 00
5565.	200 " "	" folding reel No. 5578,	" 11 50
5566.	300 " "	without reel,	" 11 00
5567.	300 " "	with folding reel No. 5578,	" 15 00
5568.	500 " "	without reel,	" 19 00
5569.	500 " "	with folding reel No. 5578,	" 23 00
5570A.	100 links "	without reel,	" 3 50
5570B.	100 " "	with plain reel No. 5574,	" 6 00
5574.	Plain Reel only, *		" 2 50
5578.	Folding Reel only, *		" 4 00
5579.	Plain detachable metal Handles,		Per pair, 50

***When ordering Reel only, always specify length of Chain Tape for which the reel is to be used.**

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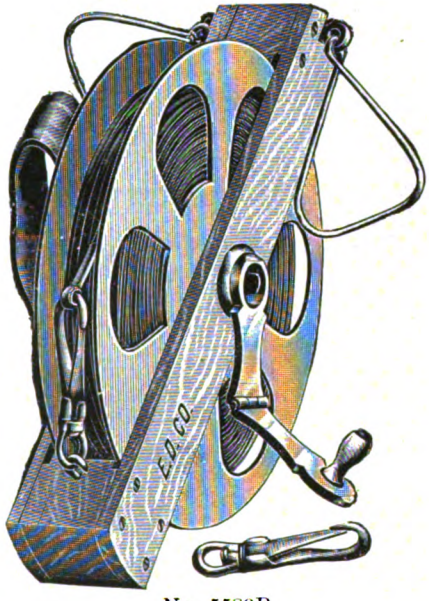
EMPIRE STEEL CHAIN TAPES *Continued*



No. 5580B.

Graduations on $\frac{1}{8}$ in. Empire Chain Tapes.

Made of best quality heavy steel $\frac{1}{8}$ ***in. wide,*** with ***etched graduations at every foot,*** end feet in 10ths. Each Tape is provided with two detachable metal handles. The Reel is of substantial sheet steel with hardwood frame and metal folding handle. One side of frame is provided with a large and convenient leather loop for holding.

No. 5580A.	100 feet long, without reel,	Each,	$ 4 50
5580B.	100 " " with reel No. 5584,	"	8 50
5581A.	200 " " without reel,	"	7 50
5581B.	200 " " with reel No. 5584,	"	11 50
5582A.	300 " " without reel,	"	11 00
5582B.	300 " " with reel No. 5584,	"	15 00
5583A.	500 " " without reel,	"	19 00
5583B.	500 " " with reel No. 5584,	"	23 00
5583C.	650 " " without reel,	"	26 00
5583D.	650 " " with reel No 5584,	"	30 00
5583E.	660 " " without reel,	"	26 75
5583F.	660 " " with reel No. 5584,	"	30 75
5584.	Reel only*,	"	4 00

***When ordering Reel only, always specify length of Chain Tape for which the reel is to be used.**

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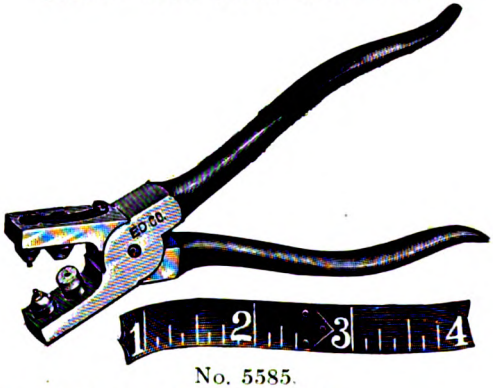
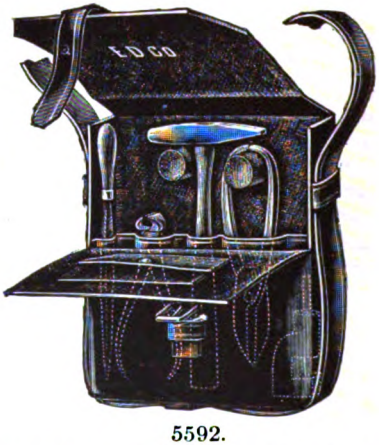
TAPE REPAIR OUTFITS



No. 5585.

No. 5585. Punch and Riveter Outfit, complete, ... Each, $4 00
5586. Extra Eyelets (two lengths), two packages of 500 each, 1 25

No. 5590.



5592.

No. 5590. Tape Repair Outfit, consisting of block and punch, rivets and piece of steel ribbon, ... Each, $2 50
5592. Tape Repair Outfit, consisting of block and punch, hammer, cutting nippers, taper file, shears, and piece of steel ribbon, in sewed Leather Case with shoulder strap and pocket containing rivets and metal sleeves for flat wire tapes, Each, 9 00

No. 5595.

No. 5595. Little Giant Tape Splice, for $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$ in. Tapes, . Each, $0 40

To repair breaks, insert broken ends; adjust by sight hole and turn down screws. Will not catch on obstructions and will withstand the strongest pull. In ordering, please mention size wanted.

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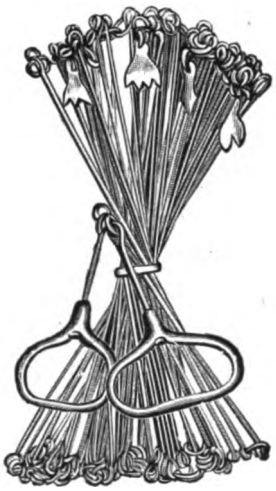
MEASURING CHAINS



No. 5603.

Of Steel, U. S. Standard.

			Each.
No. 5600.	Steel, 33 feet, W. G.	12, brazed links and rings, brass handles,	$ 5 50
5601.	" 50 " "	12, " " " " "	6 00
5602.	" 66 " "	12, " " " " "	10 00
5603.	" 100 " "	12, " " " " "	11 00
5610.	" 33 " "	12, oval rings, brass handles, ...	3 50
5611.	" 50 " "	12, " " " " . . .	4 50
5612.	" 66 " "	12, " " " " . . .	6 50
5613.	" 100 " "	12, " " " " . . .	8 00

Of Steel, Meter and Vara.

			Each.
No. 5620.	Steel, 10 meter, W. G.	12, brazed links and rings, brass h'dles,	$5 50
5621.	" 15 " "	12, " " " " "	7 50
5622.	" 20 " "	12, " " " " "	10 00
5623.	" 25 " "	12, " " " " "	12 50
5625.	" 10 " "	12, oval rings, brass handles, . .	3 50
5626.	" 15 " "	12, " " " " . . .	5 00
5627.	" 20 " "	12, " " " " . . .	6 20
5628A.	" 10 varas, "	12, brazed links and rings, brass h'dles,	5 50
5628B.	" 20 " "	12 " " " " "	10 00
5629A.	" 10 " "	12, oval rings, brass handles, . .	3 50
5629B.	" 20 " "	12 " " " " "	6 50

Of Iron, U. S. Standard.

No. 5630.	Iron, 50 feet, W. G.	8, oval rings, brass handles, . Each,	$3 50
5632.	" 100 " "	8, " " " " "	5 50

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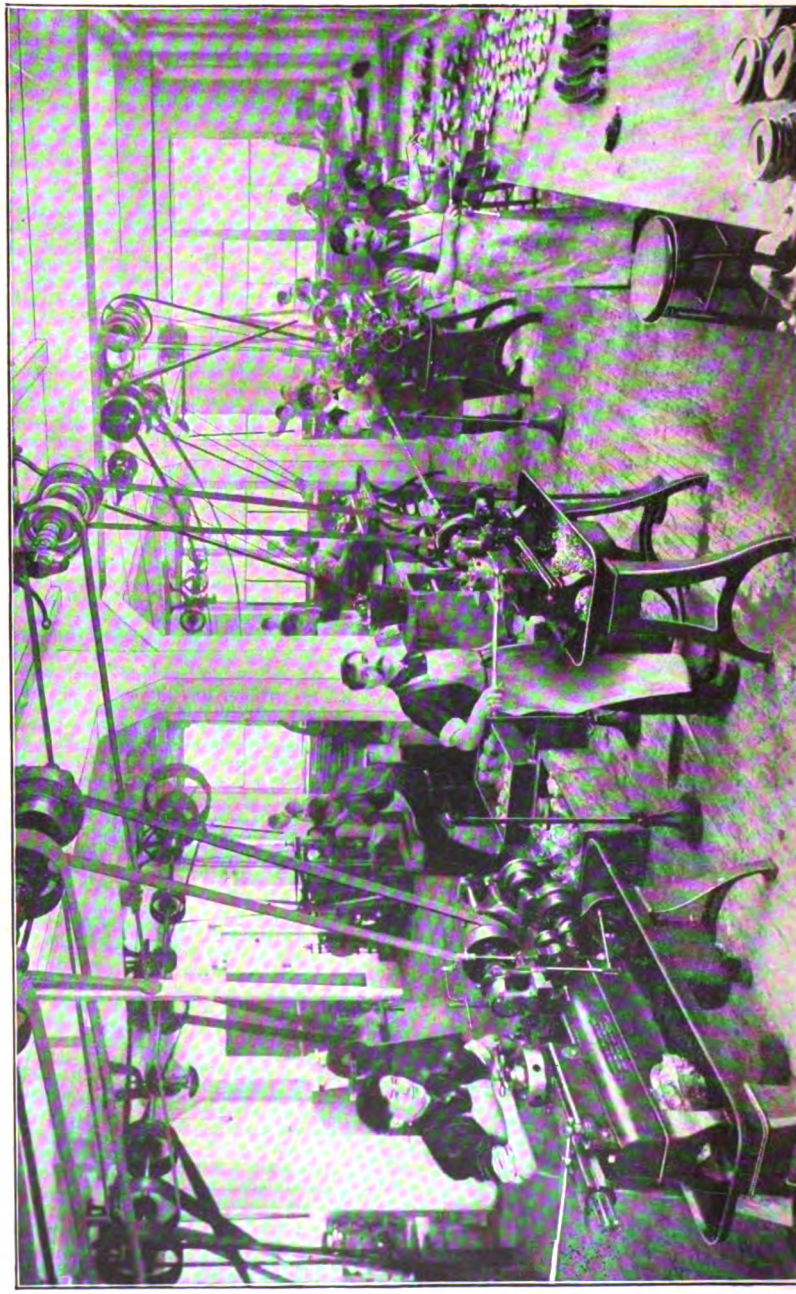

SECTION OF MACHINE SHOP — FACTORY.

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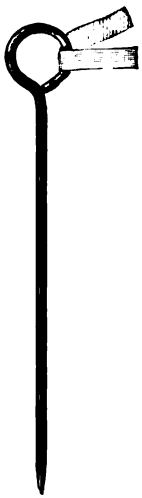
ARROWS



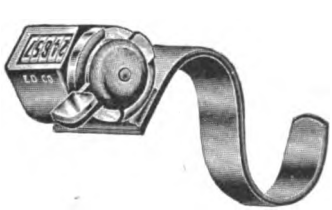
No. 5662.

5660.

5666.

No. 5660.	Steel Arrows, 11 in set, 10 in. long, W. G. 6, .	Per set,	$1 20
5661.	" " 11 " 14 " " " 6, .	"	1 50
5662.	" " 11 " 14 " " " 6, with red cloth flag attached to ring, ...	"	1 75
5664.	Iron Arrows, 11 in set, 14 in. long, W. G. 10, .	"	75
5666.	Steel " 11 " 14 " " " 6, with white enameled disc, 2½ in. diam., with red figures 1 to 11, ...	"	5 00
5667.	Canvas Carrying Case for No. 5666, with shoulder strap, ...	Each,	2 50

TALLYING MACHINES



No. 5669.

5670.

No. 5669. Tallying Machine, nickel-plated, registers to 99,999, Each, $2 00
The lower part of this machine is designed to fit the fingers of the left hand, as shown in illustration. The thumb is pressed on the lever in keeping count.

No. 5670. Tallying Machine, nickel-plated, for keeping count by pressing on a lever; registers to 999, ... Each, 2 50

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PLUMB BOBS

No. 5700.

5710.

5725.

5721.

No.	5700.	Brass Plumb Bob, about 6 oz., steel point, screw cap, Each,	$1 35
	5701.	" " " " 8 " " " " " " "	1 50
	5701A.	" " " " 10 " " " " " " "	1 65
	5702.	" " " " 12 " " " " " " "	1 80
	5703.	" " " " 14 " " " " " " "	1 95
	5704.	" " " " 16 " " " " " " "	2 10
	5706.	" " " " 24 " " " " " " "	2 70
	5707.	" " " " 6 " " " long neck, "	1 50
	5708.	" " " " 8 " " " " " "	1 75
	5709.	" " " " 10 " " " " " "	1 95
	5709A.	" " " " 12 " " " " " "	2 10
	5710.	" " " " 14 " " " " " "	2 25
	5710A.	" " " " 16 " " " " " "	2 50
	5710B.	" " " " 18 " " " " " "	2 75
	5711.	" " " " 24 " " " " " "	3 25
	5712.	" " " " 32 " " " " " "	3 75
	5717.	Plain Brass Plumb Bob, about 8 oz., steel point, . "	75
	5718.	" " " " " 12 " " " " . "	1 20
	5719A.	" " " " " 10 " " long neck, "	1 25
	5719B.	" " " " " 12 " " " " " "	1 50
	5720.	Iron Plumb Bob, about 7 ounces, ... "	60

MERCURY PLUMB BOBS

No.	5721.	Mercury Plumb Bob, 3½ oz., 4 in. long, ½ in. diam., Each,	$1 20
	5722.	" " " 6 " 4½ " " " " "	1 80
	5723.	" " " 12 " 5⅜ " " " " "	2 40
	5724.	" " " 16 " 6 " 1 " " "	3 00

STAKE TACKS

No.	5725.	Stake Tacks, galvanized, ... Per 4-ounce box,	$0 20
	5726.	" " " . . . . . Per pound,	60

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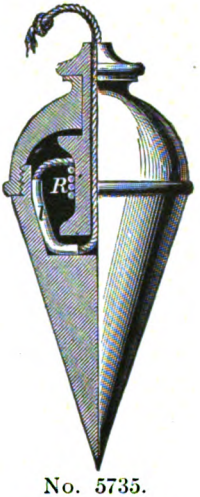
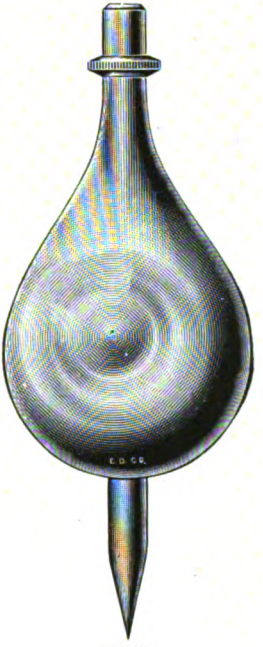
PLUMB BOBS

Continued



No. 5735.



5738.

No. 5735. Adjustable Plumb Bob, brass, 10 ounces, with concealed reel, on which the line is wound and held by friction at any point of its length, ... Each, $2 50

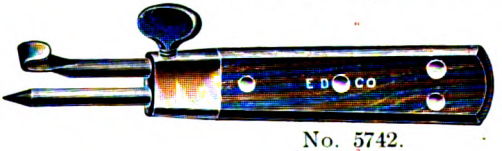
5738. Shaft Plumb Bob, brass, steel point, about 44 ounces, " 5 00

PLUMB BOB CORD

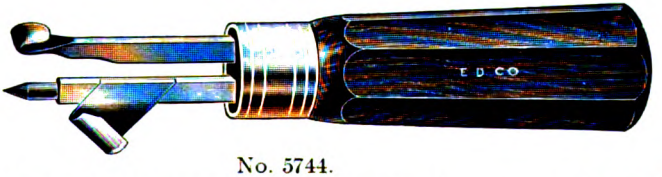
No. 5740. Plumb Bob Cord, best linen; thin, medium or thick, Per yard, $0 02

5741. " " " best braided silk, ... " 06

TIMBER SCRIBES



No. 5742.



No. 5744.

No. 5742. Timber Scribe, or Tree Marker, small, 5 in., . . Each, $1 00

5744. " " " " " large, 6½ in., . . " 1 25

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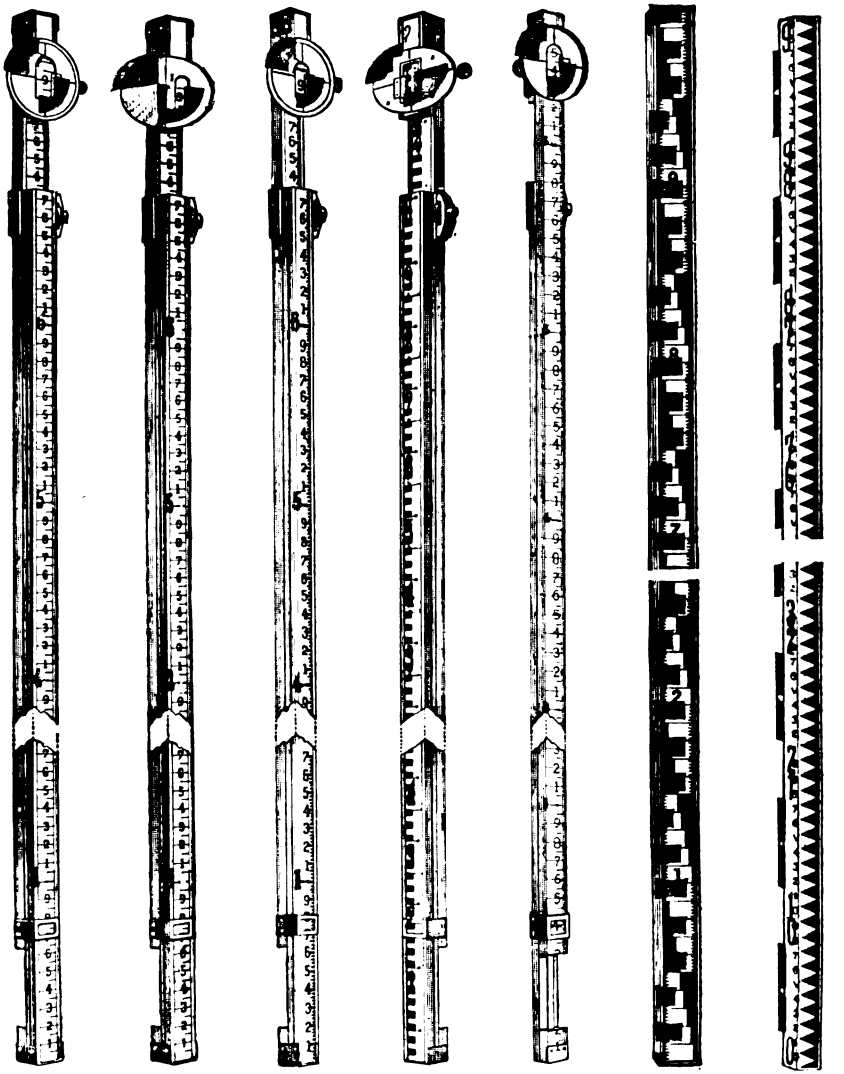
LEVELING RODS



No. 5805. 5805R. 5809. 5820. 5830. 5831A. 5832A.

For description and prices, see next page.

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LEVELING RODS

No. 5805.	**Philadelphia Rod,** Hardwood, divided into feet, 10ths and half 10ths, scale reading to 100ths, with target, scale and improved clamp, 7 feet, sliding out to 13 feet,* .	Each,	$15 00
5805A.	**Philadelphia Rod,** like No. 5805, but with oval target,* "		15 50
5805R.	" " " " 5805, " " rolling angle target,	Each,	16 00
5807.	**Philadelphia Rod,** like No. 5805, but divided into feet, 10ths and 100ths, vernier reading to 1000ths,* . . .	Each,	15 00
5807A.	**Philadelphia Rod,** like No. 5807, but with oval target,* "		15 50
5807R.	" " " " 5807, " " rolling angle target,	Each,	16 00
5808.	**Light Philadelphia Rod,** Hardwood, divided into feet, 10ths and half 10ths, scale reading to 100ths, with target, scale and improved clamp, 6½ feet, sliding out to 12 feet,*	Each,	13 00
5808A.	**Light Philadelphia Rod,** like No. 5808, but with oval target,*	Each,	13 50
5808R.	**Light Philadelphia Rod,** like No. 5808, but with rolling angle target,	Each,	14 00
5809.	**Light Philadelphia Rod,** like No. 5808, but divided into feet, 10ths and 100ths, vernier reading to 1000ths.* .	Each,	13 00
5809A.	**Light Philadelphia Rod,** like No. 5809, but with oval target,*	Each,	13 50
5809R.	**Light Philadelphia Rod,** like No. 5809, but with rolling angle target,	Each,	14 00
5820.	**Philadelphia Metric Rod,** Hardwood, divided into meters, dm. and cm., vernier reading to mm., with target, vernier and improved clamp, 2.2 meter, sliding out to 4 meter,	Each,	15 00
5823.	**Mining Rod,** Hardwood, divided into feet, 10ths and half 10ths, scale reading to 100ths, with target, scale and improved clamp, 3 feet, sliding out to 5 feet,* .	Each,	11 40
5824.	**Mining Rod,** like No. 5823, but divided into feet, 10ths and 100ths, vernier reading to 1000ths,*	Each,	11 40
5826.	**Mining Rod,** Hardwood, divided into feet, 10ths and half 10ths, scale reading to 100ths, with target, scale and improved clamp, 5 feet, sliding out to 9 feet,* .	Each,	12 00
5827.	**Mining Rod,** like No. 5826, but divided into feet, 10ths and 100ths, vernier reading to 1000ths,*	Each,	12 00
5830.	**New York Rod,** Hardwood, light color, divided into feet, 10ths and 100ths, vernier reading to 1000ths, with target, vernier and improved clamp, 6½ feet, sliding out to 12 feet,*	Each,	14 00
5830R.	**New York Rod,** like No. 5830, but with rolling angle target,	Each,	15 00
5831A.	**Florida Rod,** Hardwood, 10 feet, self-reading to feet, 10ths and 100ths (in one piece),	Each,	8 00
5831B.	**Florida Rod,** like No. 5831A, but 12 feet,	"	10 00
5832A.	**Chicago Rod,** Hardwood, 10 feet, self-reading to feet, 10ths and 100ths (in one piece),	Each,	8 00
5832B.	**Chicago Rod,** like No. 5832A, but 12 feet,	"	10 00

*** Furnished with Dietzgen "Improved Clamp" targets (see Nos. 5872A–5875C), if preferred, at same price.**

For Rod Levels, see Nos. 5878-5880.

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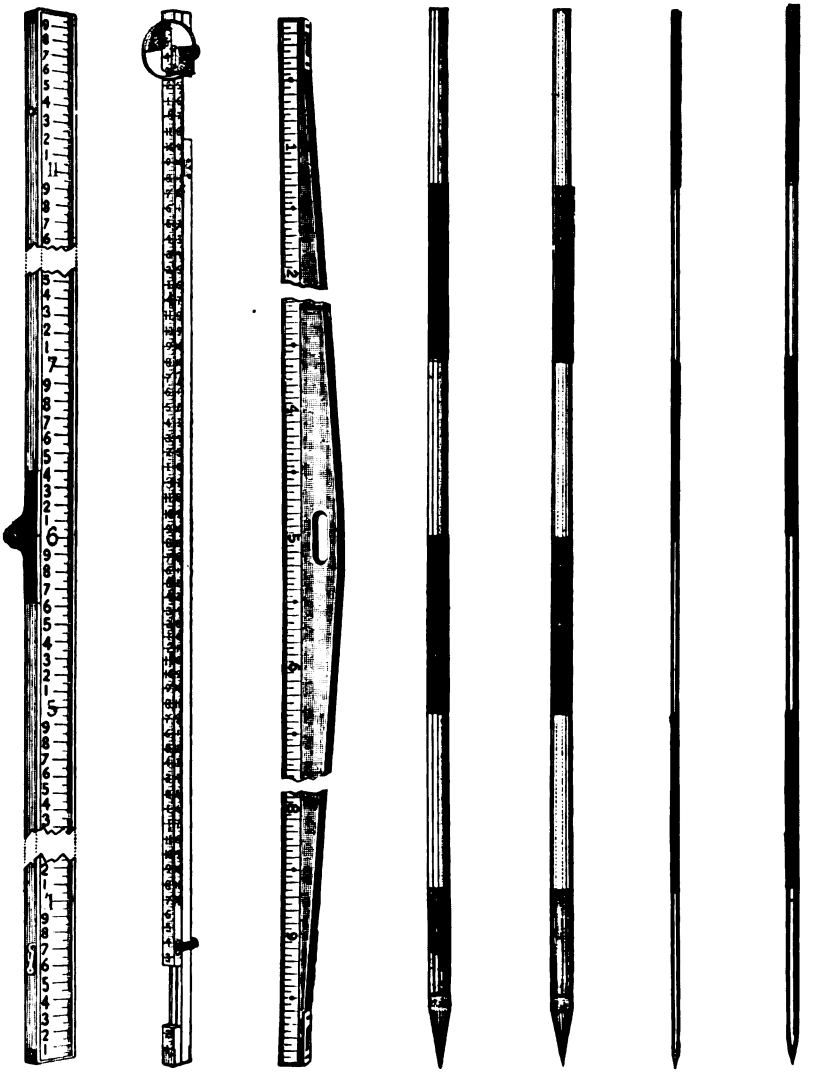
LEVELING RODS AND POLES



No. 5833. 5835. 5839. 5850. 5851. 5855. **5856.**

For description and prices, see next page.

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LEVELING RODS

No. 5833. **Stadia Rod,** self-reading, folding, with strong brass hinge, 6 feet closed, opening to 12 feet, 2 fold, . . Each, $12 00

5834. **Stadia Rod,** like No. 5833, but 3 fold, 4 feet closed, opening to 12 feet, ... Each, 15 00

The short length of this Rod when folded, permits of its being conveniently carried in railroad or trolley cars.

5834½. **Stadia Rod,** 12 feet, not folding, divided into feet and 10ths; made of well seasoned white pine, with brass shoe at each end. The 0 ft., 3 ft., 6 ft. and 12 ft. marks are red, all others black, ... Each, 10 00

5835. **Architects' Rod,** Hardwood, light color, divided into feet, inches and ½-inches, target and clamp, vernier reading to 64th in., 5½ feet, sliding out to 10 feet, . . . Each, 6 00

5836. **Architects' Rod,** like No. 5835, but divided into feet, 10ths and 100ths, vernier reading to 1000ths, . . . Each, 6 00

5839. **Cross Section Rod,** 10 feet, divided into feet, 10ths and 100ths, on both sides; level bubble at each end, and opening for the hand, ... Each, 10 00

FLEXIBLE POCKET LEVELING RODS

No. 5840.

These Rods are made of pliable strong rubber canvas, divided like self-reading rods. Can be coiled up and carried in the pocket. For use, they are fastened to a board or stick with thumb tacks.

		Each.
No. 5840.	10 feet long, 3 in. wide, divided into feet, 10ths and 100ths,	$3 25
5841.	12 " " 3 " " " " " " "	4 00
5842.	12 " " 3 " " " " inches and ⅛ inches,	4 00
5843.	3½ meters long, 3 inches wide, divided into centimeters, .	4 00
5840½.	10 feet long, 1½ in. wide, divided into feet, 10ths and 100ths,	2 50
5841½.	12 " " 1½ " " " " " " "	3 00
5842½.	12 " " 1½ " " " " inches and ⅛ inches,	3 00

RANGING POLES

No. 5850. Ranging Poles, best seasoned wood, **octagonal,** tapered, red and white alternately every foot.

	6 ft.	8 ft.	10 ft.
Each, ...	$2 00	2 25	2 50

5851. Ranging Poles, best seasoned wood, **round,** tapered, red and white alternately every foot.

	6 ft.	8 ft.	10 ft.
Each, ...	$2 00	2 25	2 50

5852. Ranging Poles, **sectional,** best seasoned wood, **round,** in two sections, red and white alternately every foot.

	8 ft.	10 ft.
Each, ...	$3 00	3 50

5854. Steel Ranging Poles (solid), **octagonal,** ½ in., turned and hardened points, red and white alternately every foot.

	6 ft.	8 ft.
Each, ...	$3 20	3 50

5855. Steel Ranging Poles (solid), **round,** ¼ in. diameter, turned and hardened points, red and white alternately every foot.

	6 ft.	8 ft.
Each, ...	$2 75	3 00

5856. Iron Tubular Ranging Poles, ½ in. diameter, red and white alternately every foot.

	6 ft.	8 ft.	10 ft.
Each, ...	$2 75	3 00	3 50

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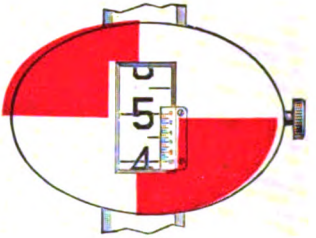
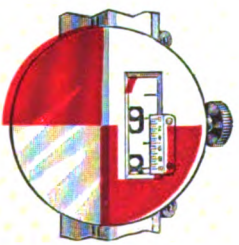
SEPARATE TARGETS FOR DIETZGEN LEVELING RODS

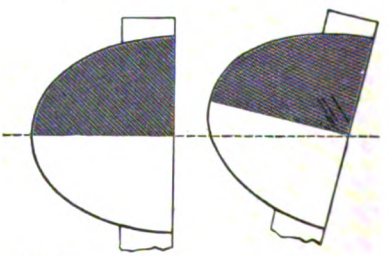
No. 5860B.



5863A.

		Each.
No. 5860A.	Round Target, scale reading to 100ths, for Rod No. 5805,	$5 00
5860B.	" " vernier " " 1000ths, " " No. 5807,	5 00
5861A.	" " scale " " 100ths, " Rods Nos. 5808, 5823 and 5826,	5 00
5861B.	Round Target, vernier reading to 1000ths, for Rods Nos. 5809, 5824 and 5827,	5 00
5863A.	Oval Target, scale reading to 100ths, for Rod No. 5805A,	5 50
5863B.	" " vernier " " 1000ths, " " No. 5807A,	5 50
5864A.	" " scale " " 100ths, " " No. 5808A,	5 50
5864B.	" " vernier " " 1000ths, " " No. 5809A,	5 50
5866.	Round " vernier " " 1000ths, " " No. 5830,	5 00





No. 5868A.

		Each.
No. 5868A.	Rolling Angle Target, scale reading to 100ths, for Rod No. 5805R,	$6 00
5868B.	Rolling Angle Target, vernier reading to 1000ths, for Rod No. 5807R,	6 00
5869A.	Rolling Angle Target, scale reading to 100ths, for Rod No. 5808R,	6 00
5869B.	Rolling Angle Target, vernier reading to 1000ths, for Rod No. 5809R,	6 00
5870.	Rolling Angle Target, vernier reading to 1000ths, for Rod No. 5830R,	6 00

The Rolling Angle Target is so arranged that the horizontal dividing line of the target is carried over two surfaces placed at right angles to each other, thus showing a continuous horizontal line only when the rod is held perpendicular to the observer's line of sight. The target springs are provided with rollers which bear against the rod and permit of a very accurate setting of the target to any desired position.

For Dietzgen "Improved Clamp" targets, see next page.

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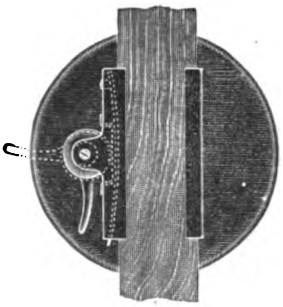
DIETZGEN "IMPROVED CLAMP" TARGETS

(Patented)



These Targets are an improvement over the screw clamp targets, as they permit of a quick but rigid clamping of the target to the rod by simply pressing the lever of an eccentric. The clamping arrangement is fully *protected* by the target, and the breaking off or bending of clamp screws, common with screw clamp targets, is eliminated.

They are made in Round and Oval form, and will be furnished with any of our Philadelphia or New York rods, in place of the regular screw clamp targets, without additional cost.

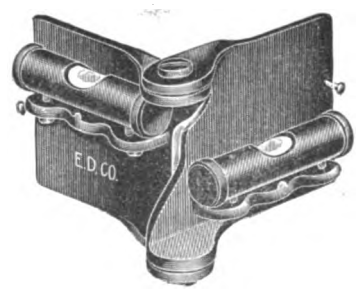
No. 5872A. Round Target, improved clamp, scale to 100ths, for Rod No. 5805, ... Each, $ 5 00
5872B. Round Target, improved clamp, vernier to 1000ths, for Rod No. 5807, ... Each, 5 00
5873A. Round Target, improved clamp, scale to 100ths, for Rods Nos. 5808, 5823 and 5826, ... Each, 5 00
5873B. Round Target, improved clamp, vernier to 1000ths, for Rods Nos. 5809, 5824 and 5827, ... Each, 5 00
5873C. Round Target, improved clamp, vernier to 1000ths, for Rod No. 5830, ... Each, 5 00
5874A. Oval Target, improved clamp, scale to 100ths, for Rod No. 5805A, ... Each, 5 50
5874B. Oval Target, improved clamp, vernier to 1000ths, for Rod No. 5807A, ... Each, 5 50
5875A. Oval Target, improved clamp, scale to 100ths, for Rod No. 5808A, ... Each, 5 50
5875B. Oval Target, improved clamp, vernier to 1000ths, for Rod No. 5809A, ... Each, 5 50
5875C. Oval Target, improved clamp, vernier to 1000ths, for Rod No. 5830, ... Each, 5 50

ROD LEVELS

No. 5878. Rod Level, brass, two level vials, . . Each, $ 3 00

An excellent Rod Level for the more accurate plumbing of leveling rods and ranging poles. It can be secured to the rod or pole, or held by hand, as desired.

When not in use it can be folded, with level vials protected, and easily carried in vest pocket.



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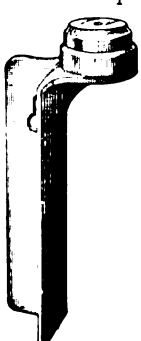

No. 5880.

No. 5880. Rod Level, brass, round level vial, 1 in., Each, $3 00

This Rod Level is used to determine that the rod is held perpendicular. By the long rectangular plate, proper contact is secured when holding it to the rod, but it may be attached to the rod by means of a flat-head screw, for which there is a key-hole slot in the plate.

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MAGNETIC POCKET COMPASSES

No. 5900.

5903.

5906.

No. 5900. Pocket Compass, Brass, watch pattern, paper dial.

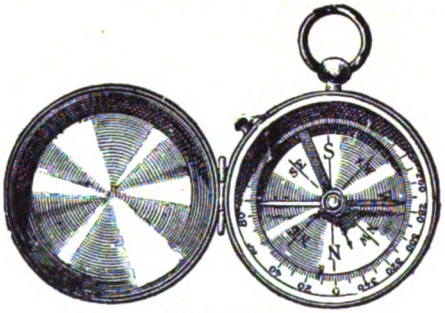
	$1\frac{3}{16}$	$1\frac{3}{4}$	$1\frac{3}{4}$ in.
Each,	$0 20	25	30

5903. Pocket Compass, Brass, watch pattern, metal dial.

	$1\frac{9}{16}$	$1\frac{3}{4}$	2 in.
Each,	$0 40	45	50

5906. Pocket Compass, Brass, watch pattern, metal dial, stop to needle.

	$1\frac{9}{16}$	$1\frac{3}{4}$	2 in.
Each,	$0 50	55	60



No. 5923.

5930.

No. 5923. Pocket Compass, Brass, watch pattern, hinged cover, metal dial, divided to 2 degrees, stop to needle, agate center.

	$1\frac{9}{16}$	2 in
Each,	$1 50	1 75

5930. Pocket Compass, bronzed hunting case, watch pattern, silvered metal dial, edge bar needle, jewel cap and self-acting stop.

	$1\frac{1}{2}$	$1\frac{3}{4}$	2 in
Each,	$2 95	3 20	3 40

5931. Pocket Compass, bronzed hunting case, watch pattern, luminous Singers' floating card dial and luminous line in lid, with luminous North and South points, jewel cap and self-acting stop.

	$1\frac{1}{2}$	$1\frac{3}{4}$	2 in
Each,	$3 00	3 65	4 25

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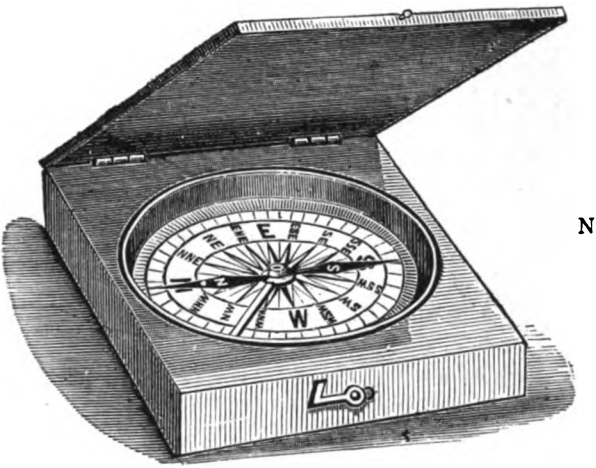
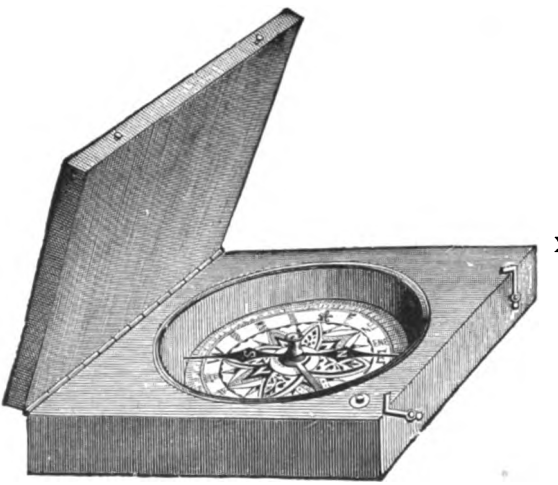


No. 5933.

No. 5933. Mahogany Case, 3×3 in., card dial, 2-in. needle, with stop, full circle division, ... Each, $1 25

5936. Mahogany Case, 3×3 in., metal dial, 2-in bar needle, with stop, jeweled, full circle division, ... Each, 2 40



No. 5937A.

No. 5937A. Mahogany Case, enameled card dial, best tempered edge bar needle 1½ in., with jewel cap and stop, . . . Each, $2 15

5937B. Same as No. 5937A, but with 2-in., needle, . . " 2 35

5937D. Mahogany Case, silvered metal dial, best tempered edge bar needle 1½-in., with jewel cap and stop, . . Each, 2 50

5937E. Same as No. 5937D, but with 2-in. needle, . . " 2 75

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MAGNETIC POCKET COMPASSES *Continued*

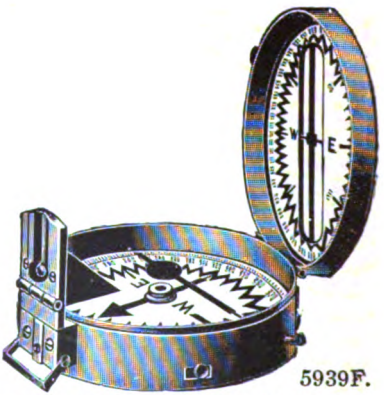
No. 5938.

No. 5939B.

No. 5938. Military Compass, 3×3 in., bar needle about 2½ in., with agate centre and automatic stop, graduated on raised metal ring to degrees. Polished mahogany box with sighting line on inside of cover, ... Each, $ 4 00

5939B. Military Night Marching Compass, bronzed hunting case, aluminum dial graduated to 5 degrees, luminous centre, with sight in lid and sight hole in pendant, . . Each, 10 75

No. 5939D.



5939F.

No. 5939D. Collapsable Mariner's Pocket Compass, 2 in., nickel hunting case, watch pattern, with gimbals constructed to collapse, Singer's pearl dial with stop, with luminous North and South points, ... Each, $ 7 75

5939F. Day and Night Prismatic Compass, 2 in., floating card dial, graduated luminous centre, with central movable setting and reading bar, sight vane in lid and case. Inside of lid fitted with a luminous graduated card for map reading and protracting purposes and night marching. In leather sling case, ... Each, 19 80

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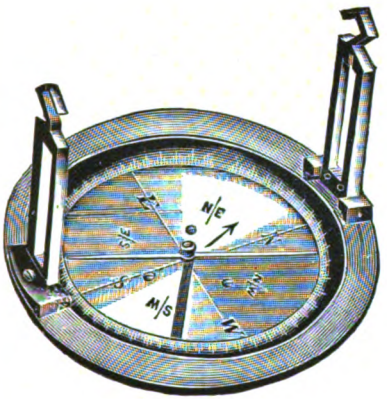
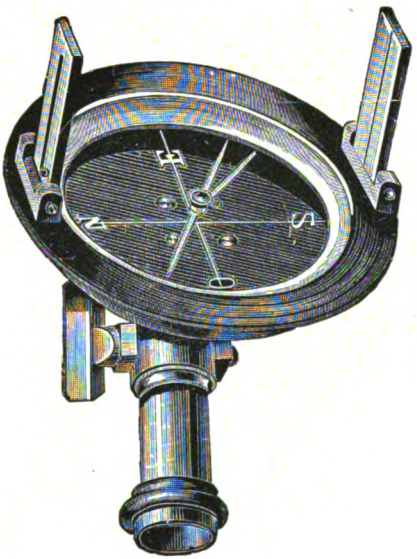
SURVEYING COMPASSES



No. 5940.



5944.

No. 5959.

No. 5940.	Surveying Compass, with folding sights, ending in hooks, graduated to 2 degrees, needle 2 in., in case, . . . Each,	$	6 00
5941.	Same as 5940, needle 2¼ in., in case, "		7 00
5942.	Same as 5940, needle 2½ in., in case, "		8 00
5944.	Surveying Compass, with folding sights, graduated to 1 degree, with ball joint and socket for Jacob-staff mounting, needle 2½ in., in case, . . . Each,		10 00
5946.	Surveying Compass, silvered compass box, graduated on raised ring to degrees, needle 3½ in., with ruby center and stop, ball and socket joint, in case, Each,		12 00
5948.	Surveying Compass, with folding sights, graduated to 1 degree, with two bubbles, ball joint and socket for Jacob-staff mounting, needle 2½ in., in case, ... Each,		13 50
5949.	Same as 5948, needle 3½ in., in case, "		14 50
5957.	Same as 5948, needle 4⅛ in., in case, "		16 00
No. 5958	Jacob-staff, 5 feet, iron shoe, ... "		1 00
5959.	Tripod, with Jacob-staff top for Compasses, light, "		3 00
5960.	Tripod, hardwood, solid leg, with detachable brass staff head, for Compasses Nos. 5940–5957, 5967A, 5968A and 5975, Each,		5 00

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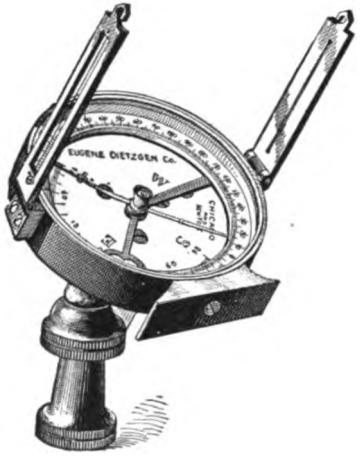
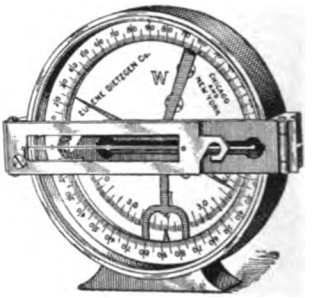
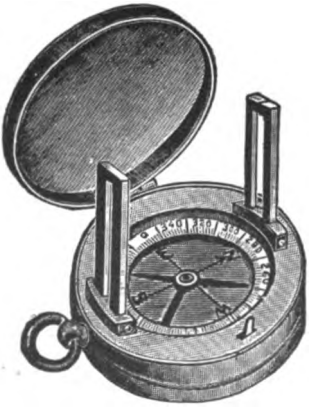


As Compass.



No. 5963. As Clinometer.

No. 5963. Surveying Compass and Clinometer, bronzed, with folding sights ending in hooks, graduated to degrees, with ball joint and socket for Jacob-staff mounting, needle about 2½ in., in case, ... Each, **$13 70**



No. 5965.

No. 5965. Pocket Compass, nickel-plated, watch pattern, with folding sights, stop to needle.

	2	2⅜	2¾ in.
Each,	**$4 50**	**5 75**	**7 00**

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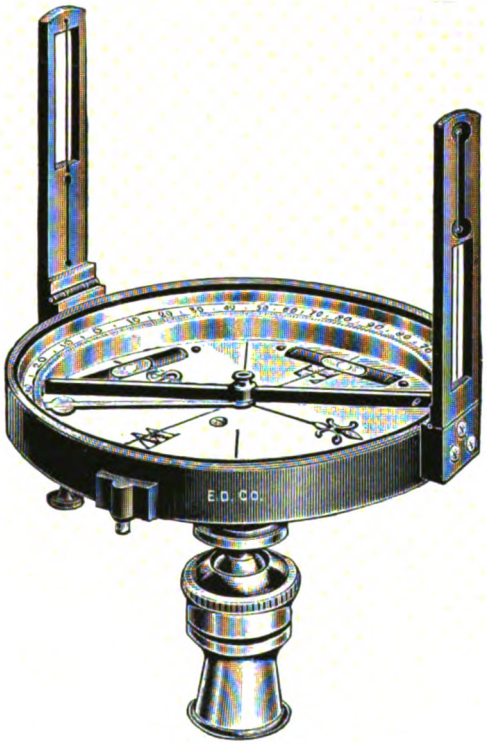
SURVEYING COMPASSES *Continued*



No. 5967A.

No. 5967A.	Improved Surveying Vernier Compass, 3½ in. needle with jewel and stop, silvered compass box, graduated on raised ring to degrees, variation ring movable by rack and pinion, reading to 5 minutes, folding sights, two levels, ball joint and socket for Jacob-staff mounting, in polished mahogany case, ... Each,	$18	00
5967B.	Same as No. 5967A, but with light extension tripod, "	23	00
5968A.	Surveying Vernier Compass, same as No. 5967A, but with 4½ in. needle, ... Each,	20	00
5968B.	Same as No. 5968A, but with light extension tripod, "	25	00
5970.	Surveying Compass, 4 in. needle, two straight spirit levels, Jacob-staff mountings, brass cover, with variation plate reading to one minute, out-keeper, sights graduated for taking angles of elevation or depression, in box, Each,	32	50
5971.	Same as No. 5970, but with 5 in. needle, . . . "	37	50
5972.	Same as No. 5970, but with 6 in. needle, . . "	42	50

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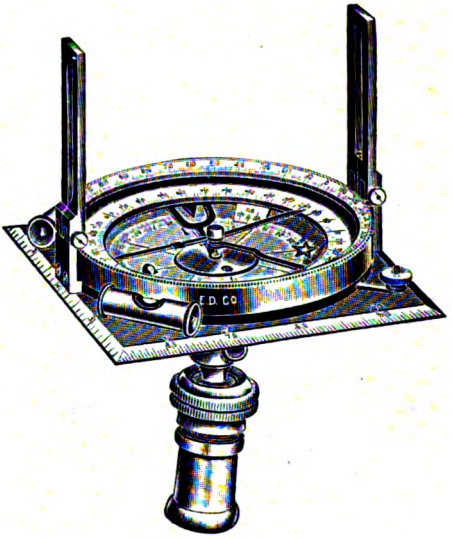
GEOLOGISTS' COMPASS AND CLINOMETER



No. 5975.

No. 5975. Geologists' Compass and Clinometer (Aluminum), 2⅝ in. needle, two levels, Jacob-staff mountings, folding sights, variation arc, movable sighting circle and base graduated, in mahogany box, ... Each, **$26 50**

This Instrument is particularly adapted for topographical work. The compass circle and 2⅝ in. needle are enclosed in a circular box which is attached to a base four inches square. The edges of the base are beveled and graduated; two of them with a tangent scale and the other two with scales of eighths and tenths of inches. The compass circle is movable, and by means of an inside vernier the variation of the needle can be set off to five minutes. On the south side of the compass face is an arc of 180°, figured from 0 to 90 on each side of the zero line, and when the compass rests on its south edge the angle of slope is indicated on this arc by a small pendulum hung from the center-pin. On the outside of the circular box, which contains the compass needle, is a movable circle, beveled and graduated on its upper edge and figured from 0 to 90, with a slot for sighting at each quadrant; on the edge of the box two folding sights are attached.

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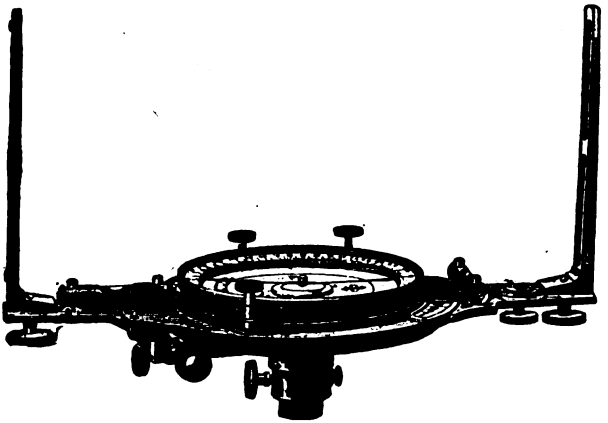
RAILROAD COMPASSES



No. 5981.

No. 5980. Railroad Compass. The Railroad Compass has the main plate, levels, sights and needle, Jacob-staff mountings, brass cover, out-keeper, and vernier for setting off the variations of the needle of the ordinary Surveyors' Compass, but has also underneath the main plate a divided circle or limb, by which horizontal angles to single minutes can be read independently of the needle, in mahogany box with lock and strap, 5½ in. needle, one vernier to limb, ... Each, $65 00

5981. Railroad Compass. Same as No. 5980, but with 5 in. needle and two verniers to limb, ... Each, 75 00

5982. Railroad Compass. Same as No. 5980, but with 5½ in. needle and two verniers to limb, ... Each, 80 00

5982½. Tripod, for Nos. 5980-5982, ... " 6 00

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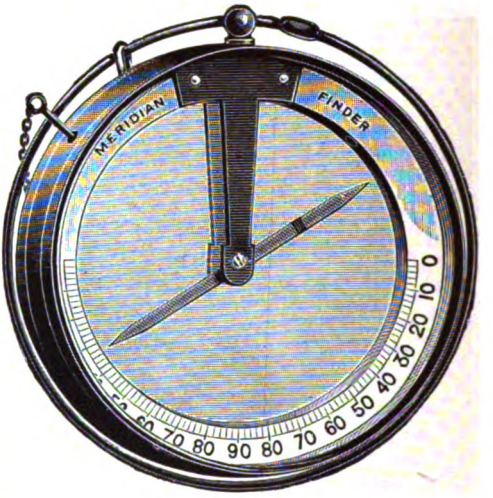
MINERS' COMPASSES AND LAMP

No. 5983A.



5985.

No. 5983A. One Plummet Lamp, of brass, steel point, about 20 ounces, in mahogany box with strap, ... Each, $10 00

5983B. Two Plummet Lamps, like No. 5983A, in one mahogany box with strap, ... Pair, 18 00

5985. Miners' Compass, for tracing iron ore, with 3 in. dip needle, mounted in a brass ring graduated 0 to 90° in each direction, and having plate glass top and bottom. When used for tracing ore, the prospector should hold the ring in his hand and keep the needle north and south, standing with his face to the west; in velvet lined case, . . . Each, 12 00

5987. Meridian Finder, or Miners' Compass, with 3 in. Norwegian needle, suspended in gimbals. The advantage of this compass is that the needle has a motion in azimuth as well as in altitude, thus insuring the needle finding its true meridian. Also that the needle is suspended in such a way that it turns easily with nothing to impede its revolution; by this means you have a perfect test in reversing the needle. Another advantage is that the needle is, and can be made more sensitive than other needles of this kind; in case, ... Each, 14 00

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SIGHT COMPASS AND CLINOMETER

No. 5988—As Clinometer.

As Sight Compass.

No. 5988. Bronzed Sight Compass and Clinometer, metal dial, graduated to 1 degree, edge bar needle with stop. The sights are pivoted to the compass box and connected by a cross bar, which is turned down to serve as foot when the instrument is used as Clinometer. The Clinometer gives inclinations in inches per yard and in degrees. Diameter 2½ in., in leather case, ... Each, $ 7 25

5989. Same as above, diameter 3 in., in leather case, . . " 8 75

5989½. " " " " 4 in., " " " . . " 10 45

No. 5989B.

No. 5989B. Military Clinometer, bronzed case, 3 in., for measuring angles of elevation or depression, ivory arc scale held clamped, and by pressing on knob, is released to swing freely. The graduations of the arc are from 0 to 45° in each direction; the red scale denotes elevation, the black scale depression, in leather sling case. . . . Each, $19 25

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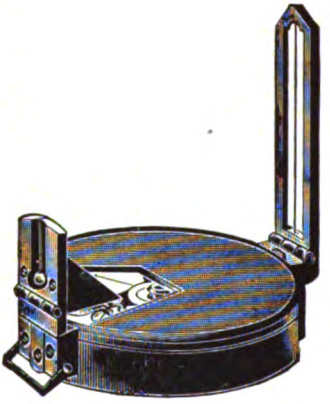
PRISMATIC COMPASSES



No. 5991.

No. 5990. Hutchinson's Prismatic Compass, bronzed, of improved pattern, with opening in top, floating card dial, 2 in., in morocco case, ... Each, $11 00

5991. Same as No. 5990, but 3 in., in leather sling case, . " 16 00

No. 5995.

No. 5995. Patent Prismatic and Pocket Compass, bronzed, hunting case; can be used as an ordinary compass without opening the cover, and a prismatic compass by raising the cover; glazed with a stout glass, on which is etched a line answering for the sight. With Singers' patent card dial, 2 in., Each, ... $15 00

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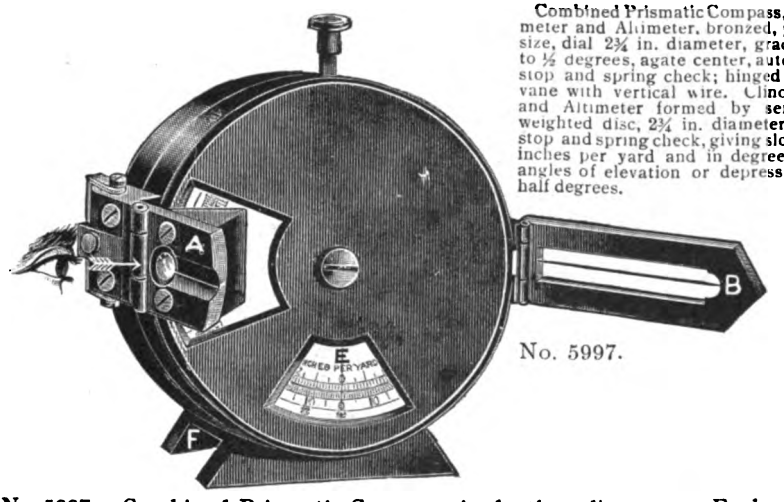
PRISMATIC COMPASSES *Continued*



No. 5997.

Combined Prismatic Compass, Clinometer and Altimeter, bronzed, pocket size, dial 2¾ in. diameter, graduated to ½ degrees, agate center, automatic stop and spring check; hinged sight-vane with vertical wire. Clinometer and Altimeter formed by sensitive weighted disc, 2¾ in. diameter, with stop and spring check, giving slopes in inches per yard and in degrees, and angles of elevation or depression in half degrees.

No. 5997. Combined Prismatic Compass, in leather sling case, Each, **$27 00**

Prismatic Military Compass, heavy bronzed, with hinged lid, 2½ inch diameter, with sighting line in lid. Outside of case is divided to 5 degrees with lettered compass points to correspond. The rim holding glass is milled for revolving when using the direction line, pearl dial, machine divided and engraved; with two circles of divisions, the outer circle is for use with prism and divided to single degrees, the inner circle is divided to 5 degrees. Centre of the dial is luminous, "N" and "S" being marked by arrow point and line E and W points being lettered to correspond. The top and bottom of sight line in lid is also made luminous. A rubber friction ring is fitted underneath case.

No. 5998.

No. 5998. Prismatic Military Compass, in leather sling case, Each, **$28 50**

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SECTION OF SURVEYING INSTRUMENTS DEPARTMENT — FACTORY

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ENGINEERING AND SURVEYING INSTRUMENTS

MADE BY

EUGENE DIETZGEN CO.

The Transits and Levels, as illustrated and described on the following pages, embody all the latest improvements. The materials employed in their manufacture are the best obtainable, and the workmanship is of the highest order. The increased demand for our instruments is very gratifying to us, signifying, as it does, that our ideas of design and construction have met with the approval of the engineering profession.

The illustrations show the design of our regular stock instruments, but we are prepared to make such alterations, as far as practicable, which the experience of our professional friends may demand.

Following will be found a general description of the most essential parts, and after each instrument listed complete specifications are given, which fully explain the instrument in detail, thus aiding our patrons in the selection of an instrument best suited for their purposes.

THE TELESCOPE

The optical and mechanical parts of our telescopes represent a thorough study, covering many years of experience; and, as it is necessary, in each particular instrument, that these parts be in perfect harmony with all other factors, great care is taken in adapting the proper combination of lenses and securing the most perfect mechanical construction.

To obtain the highest degree of perfection the achromatic object glass is of extra large diameter and of increased focal length. It is made of the celebrated Jena glass, which has an unequaled index of refraction and power of dispersion. The lenses for the terrestrial eye-piece are ground to special formulæ by the most eminent opticians. With these features, we gain for our telescopes a high magnifying power, increased illumination and a large, flat and well-defined field. The lenses are mounted in the best possible manner, accurately centered and need no further adjustment with regard to the axis of the telescope.

The telescope slide is skillfully fitted directly into the main tube by an improved method, thus obtaining a perfectly true and smooth working slide, which is absolutely necessary to make the line of collimation true for all distances and obtain permanent alignment. To further preserve this accuracy all of our telescopes are provided with dust and rain protectors. The motion of the slide for precise focusing is controlled by a rack and pinion, and the eye-piece is focused by simply turning the cap covering the eye-end to right or left, about one-sixth of a revolution, thus obtaining a true and even motion.

The telescopes are all balanced when focused for infinity, are reversible at both ends and provided with a center point for overhead centering.

To insure uniformity in quality, every telescope is tested, compared with and must conform to, a standard of excellent properties.

MAGNIFYING POWER

The power selected for each of the many styles of telescopes is the one where the slightest motion of vernier or levels can be easily observed in the field of view. A higher power is needless and will only proportionately decrease the illumination, consequently, to obtain the best results, the magnifying power of a telescope should not be greater than its intended purposes demand in order to maintain a large, flat field with ample light and good defining qualities.

While telescopes may vary in the construction of the eye-piece, they are all subject to the same fundamental rules of optics with regard to magnifying power, field and light. Therefore, a set of lenses can be at its maximum efficiency only at one point.

In the terrestrial (erecting) telescopes of our Transits the power ranges from 18 to 28 diameters, and in the telescopes of our Y levels, with increased focal length and larger object glasses, a power of 28 to 40 diameters is attained. This same ratio is adhered to with telescopes having astronomical or inverting eye-pieces.

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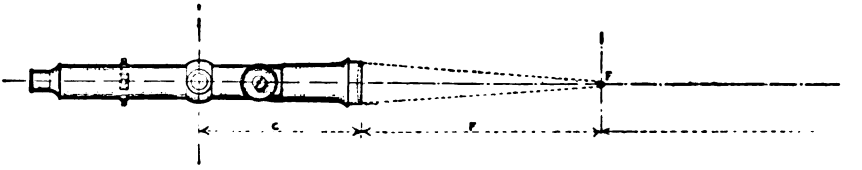
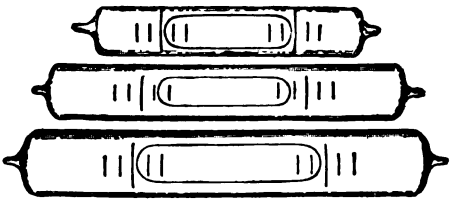
THE STADIA



The Stadia is a device for measuring distances, and consists essentially of two extra parallel hairs in addition to the ordinary cross hairs of the transit or level telescope. The stadia hairs may be adjustable or they may be fixed permanently on the diaphragm.

In our Transit and Level telescopes the fixed stadia hairs are so set that they will intercept one foot on a rod at a distance of 100 feet; since the image of the cross hairs is projected to a point beyond the telescope objective equal to its focal length, the rays of light converge at that point and measurements must begin from there, therefore, a constant is to be added to all stadia readings equal to the focal length of the object glass plus the distance from the face of objective to the center of the instrument. This constant is termed "F + C" and for transit telescopes is equal to about one foot. The stadia hairs are the most superior of the many appliances for measuring distances. With the telescope furnished with our instruments possessing all of the best optical and mechanical qualities that can be produced, we feel justified in warranting good results.

SPIRIT LEVELS



The level vials used on our instruments are all accurately ground to a true curve by special automatic machinery, thereby securing more uniform and reliable results than generally obtained. They are absolutely symmetrical and are tested and selected as to their sensibility in accordance with the use of the instrument for which they are intended. Their sensitiveness is such that any slight change of adjustment is quickly indicated, thus insuring accurate and reliable work. For this reason they are far superior to bubbles that are *sluggish* in action, and which, being unresponsive, seemingly indicate perfect adjustment quicker, but with results that are uncertain and unreliable. Great care is exercised in mounting them into their respective tubes, to avoid all undue strain. They are all graduated on the glass, as this affords the best and most satisfactory means of centering and reading the bubble.

The liquid with which they are filled is a compound which has the smallest degree of expansion and contraction. It is quick-acting and adaptable to all climates.

In addition to our regular grades we can also furnish, for Precise levels and Astronomical instruments, vials which have a sensitiveness of one second or finer.

GRADUATIONS

This very important feature of Transits and Triangulation instruments receives, on our make, minute attention. With the aid of automatic dividing machines of the highest efficiency, we can guarantee accurately centered and equidistant spaced graduations. These graduations are, for all practical work, perfect, as the errors are so small that they cannot be eliminated by human ingenuity.

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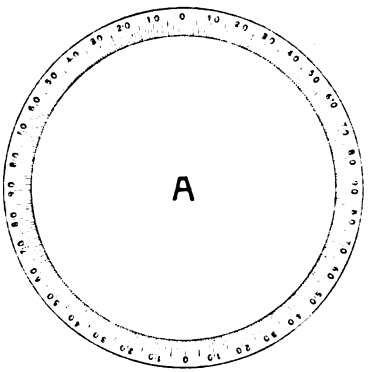
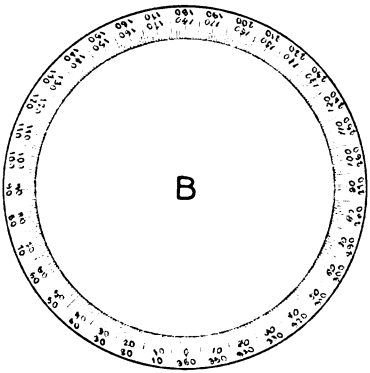
The lines of our graduations are exceptionally legible, absolutely straight, smooth, uniform in thickness and thoroughly black throughout their entire length. All numbers are machine engraved instead of being stamped, and inclined in the direction they are to be read.

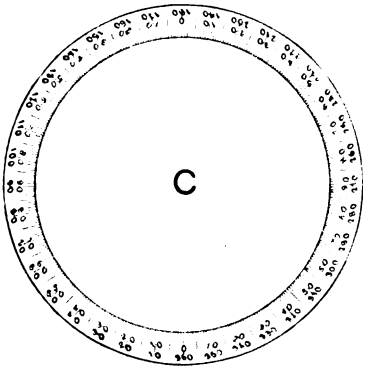
The usual method of numbering the degrees of our circles is indicated in the illustrations A, B, C and D, but other styles can be made to order without extra cost.



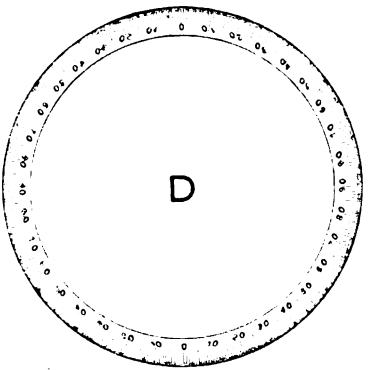
Compass ring, numbered in quadrants.



Horizontal circle, numbered 0–180 and 0–360.



Horizontal circle, numbered in quadrants and 0–360.



Vertical circle, numbered in quadrants.

It will be noticed that the compass ring is numbered in quadrants, 0 to 90 each way, as in figure A.

The horizontal circle of the Engineers' Transit is numbered with two rows of figures, from 0 to 180 and 0 to 360, as in figure B.

The horizontal circle of the Mountain and Mining Transit is numbered as in figure C, the inner row in quadrants and the outer row from 0 to 360.

The vertical circle is numbered in quadrants, 0 to 90 each way, as in figure D.

The graduations of the verniers and horizontal circles of all our Transits are made on *solid silver*, as this is the only satisfactory surface for fine graduations. The fitting of these parts is so accurate and true that no space is visible between them, and, as the surfaces are exactly on the same plane, parallax is avoided.

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The verniers of our various styles of Transits are made to read to single minutes, 30 seconds, 20 seconds or 10 seconds, as shown in the accompanying illustrations.

In the following formulæ: M = the number of spaces of vernier which correspond to the spaces of the circle; a = value of one division of the circle; a′ = value of one division of vernier; a − a′ = the least count of vernier, or the smallest reading of the circle.

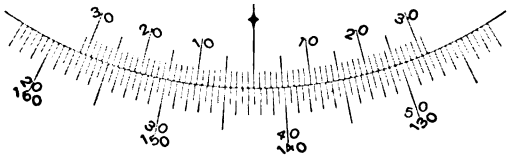

Fig. 1.

Fig. 1. Circle divided to half-degrees, vernier reading to single minutes.

$$M = \frac{a}{a - a'} \text{ then } M = \frac{30'}{1'} = \frac{30 \times 60''}{60''} = 30$$

therefore 30 spaces of the vernier must equal 29 spaces (M − 1) of the circle.

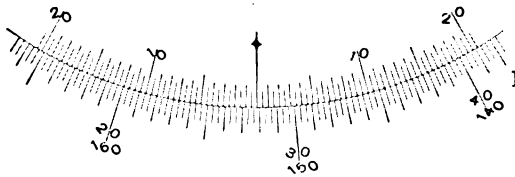

Fig. 2.

Fig. 2. Circle divided to 20 minute spaces, vernier reading to 30″.

$$M = \frac{20 \times 60''}{30''} = 40$$

therefore 40 spaces of the vernier must equal 39 spaces (M − 1) of the circle.

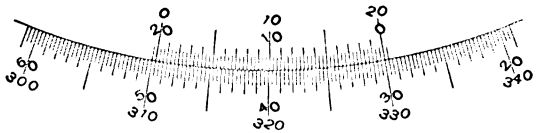

Fig. 3.

Fig. 3. Circle divided to 20 minute spaces, vernier reading to 20″.

$$M = \frac{20 \times 60''}{20''} = 60$$

therefore 60 spaces of the vernier must equal 59 spaces (M − 1) of the circle.

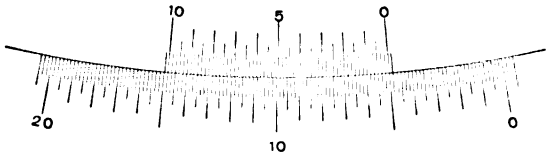

Fig. 4.

Fig. 4. Circle divided to 10 minute spaces, vernier reading to 10″.

$$M = \frac{10 \times 60''}{10''} = 60$$

therefore 60 spaces of the vernier must equal 59 spaces (M − 1) of the circle.

The above described verniers are the ones commonly furnished with our instruments, but we are prepared to make to order any other style specified.

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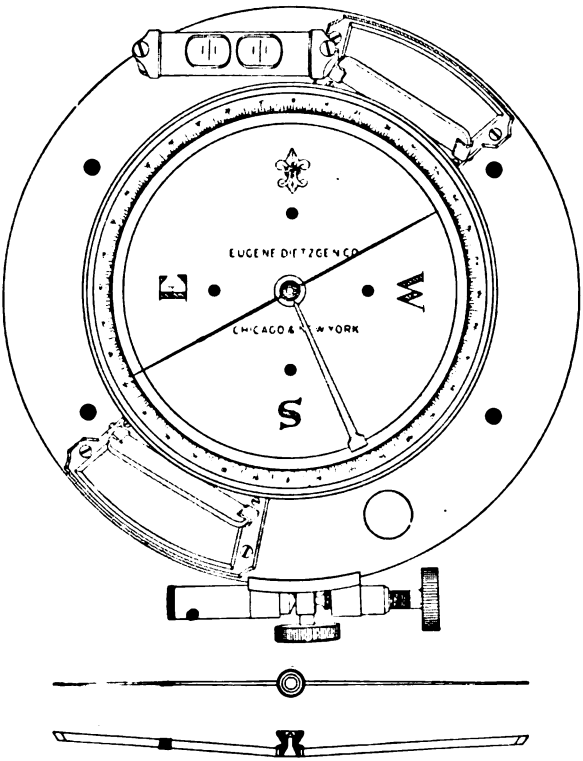

COMPASS

The compass ring is graduated to half-degrees and numbered from 0 to 90 from North and South.

The magnetic needle, as applied to our compasses, has the greatest area in the vertical direction and tapers from the center outward to a thin edge, as long experience has proven that this form is the best.

Great care is exercised in the selection of the steel used and also that the arms of the needle bar are in line with the structural grain.

The center of the needle is a highly polished and properly formed agate bearing, which rests on a hardened steel pin. The South end of the needle, in the Northern hemisphere, is provided with a fine coil of wire which can be shifted to equalize the difference of attraction.

VARIATION PLATE

As the magnetic pole constantly varies in all parts of the globe, and the deviation increases or declines as the time moves on, we attach to our Surveyors' transits a movable ring or plate, called the variation plate. This attachment enables the engineer to guard against errors arising from either adding or subtracting the magnetic variation for the latitude in which the instrument is to be used.

STANDARDS

The standards of our Transits have been designed with the same care as all of the other parts, with the object of furnishing instruments harmonious in all their details. They are cast of phosphor bronze, and well ribbed, thus combining lightness with the greatest lateral strength, and are firmly secured to the horizontal plate of the instrument by enlarged bases and well-fitted screws.

The bearings for the telescope axis are of conical shape and fitted with the greatest care. One of the standards has, near its upper end, an adjusting device, consisting of a small box, which, by means of a screw underneath, can be raised or lowered and the telescope axis thus brought in a truly horizontal position.

Responding to the demand for instruments of the highest type of perfection, we have designed a number of Transits with *U-shaped standards*. As our U-shaped standards are cast in *one piece* of the highest quality of phosphor bronze, their upright and lateral stiffness is much greater than that of the usual form. They are well ribbed, and their weight is but slightly heavier than that of the straight standards.

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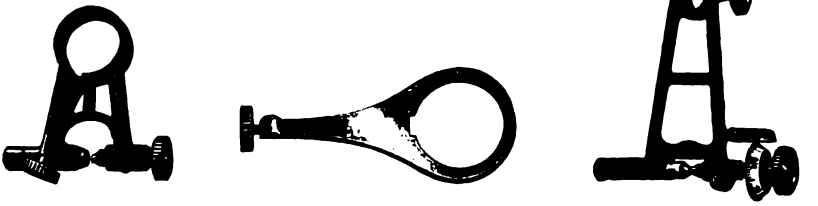
CLAMP AND TANGENT SCREWS

The clamps act entirely on the centers, both plates are free from any strain and when clamped the levels are unaffected. This construction allows the plates to be fitted so closely that the entering of dust or grit between them is impossible.

The tangent screw consists of a single screw, made of phosphor bronze or German silver, with an opposing spiral spring to take up the lost motion. The motion produced by the action of the tangent screw is perfectly smooth and will not be destroyed even if the screw should become injured.



The position of the clamp and tangent screws is such that they are convenient, well protected and accessible to either hand. The tangent screw on our Levels is attached to the cross bar, and the clamp revolves with it and is always in the same relative position.

CENTERS

Great importance is attached to the centers of the instrument, as accurate working and final results are dependent upon them. It is therefore necessary that the proper material, most skillful labor and best adapted machinery be employed in their manufacture.

The material we select is the hardest bell metal for the inner center, and gun metal and phosphor bronze for the outer centers. They are of such form as our experience has proven to be the most serviceable, extra long with increased bearing surfaces, perfectly tapered and fitted to obtain great accuracy, and made of single castings, with strong, substantial flanges.

As we use the most improved machinery, we feel confident that our centers are truly spherical and accurately fitted throughout their entire length.

The centers for Y levels, where steel or iron is permissible, are made of tool steel, and when extreme accuracy is desired a cast iron socket is used in place of phosphor bronze, which insures perfect working under all temperature changes, as the co-efficient of expansion is nearly equal.

All of our Transits and Theodolites, whether with three or four leveling screws, are made with the so-called shifting head, or shifting center, by which the instruments, after they are approximately set by the tripod legs, can be precisely centered over a given point The range of shift varies from one-half inch to one inch, according to the size of the instrument.

PARALLEL PLATES

This part of our instruments, to which the leveling screws are attached, is of the most improved design, giving ample space for manipulating the leveling screws. The four arms into which the leveling screws are fitted are strongly braced and of extra height, to give a long bearing and good wearing surface for the screws.

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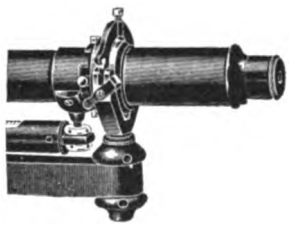
The leveling screws, which receive more hard usage than any other part of the instrument, have specially deep threads and are cut on an automatic screw cutting lathe, which insures uniformity of pitch, with consequent smooth motion and a greater durability than the V-threads usually employed. They are made of one solid phosphor bronze and hammered casting, and are carefully fitted and protected by dust caps. The lower terminals are spherical in form and provided with suitable cups. As the milled finger heads of the screws are large, they afford an easy manipulation.

LEVELING INSTRUMENTS

The general description given on these pages applies equally to the various parts of our Y levels and Dumpy levels.

The cross bars on these instruments are long and well ribbed, while the centers are strong, with extra long bearings. The wyes are provided with an improved locking device (patented July 19, 1910), as shown in illustration.



Showing improved locking device.

As will be noted, this device consists of a slide, *permanently* attached to the upright of the yoke, engaging the clip when closed and securely fastening the telescope into the wye, thus dispensing with the ordinary locking pin and cord attachment.

FINISH

The finish generally applied to our instruments is the dark or bronze finish, well lacquered. This finish has the advantage that it absorbs the rays of the sun and makes the field manipulation more agreeable to the user. The smaller parts are finished bright, which gives the entire instrument a neat and pleasing appearance.

Some of our instruments are made with a cloth finish, which, while less expensive than either the bronze or bright finish, is very lasting for the reason that it is, as made by us, carefully applied and well baked. As, with this finish, highly polished surfaces are unnecessary, it can be quickly and cheaply restored.

TRIPOD

The style adopted for our instruments is of the split-leg type and the tripod is made of *one piece* of carefully selected and thoroughly seasoned hardwood, of a grade which experience has proven to give the best results in field service.

The shoe is made of iron, with a long taper to insure a permanent and rigid fastening, while at the top and on the outside is provided a suitable spur, to admit, by applying the boot, of giving the tripod a firm bearing and setting it securely into the ground.

The metal head, which receives the instrument, and to which the legs are fastened, is made of one phosphor bronze casting. The lugs are cast hollow and a long bearing is provided for the bolts which fasten the legs. The thread portion of the head is protected by a metal cap.

The metal parts are bronzed and lacquered, while the wood is thoroughly oiled and filled, and made impervious to moisture by the application of two coats of shellac and one of rubbing varnish. This finish is permanent and durable.

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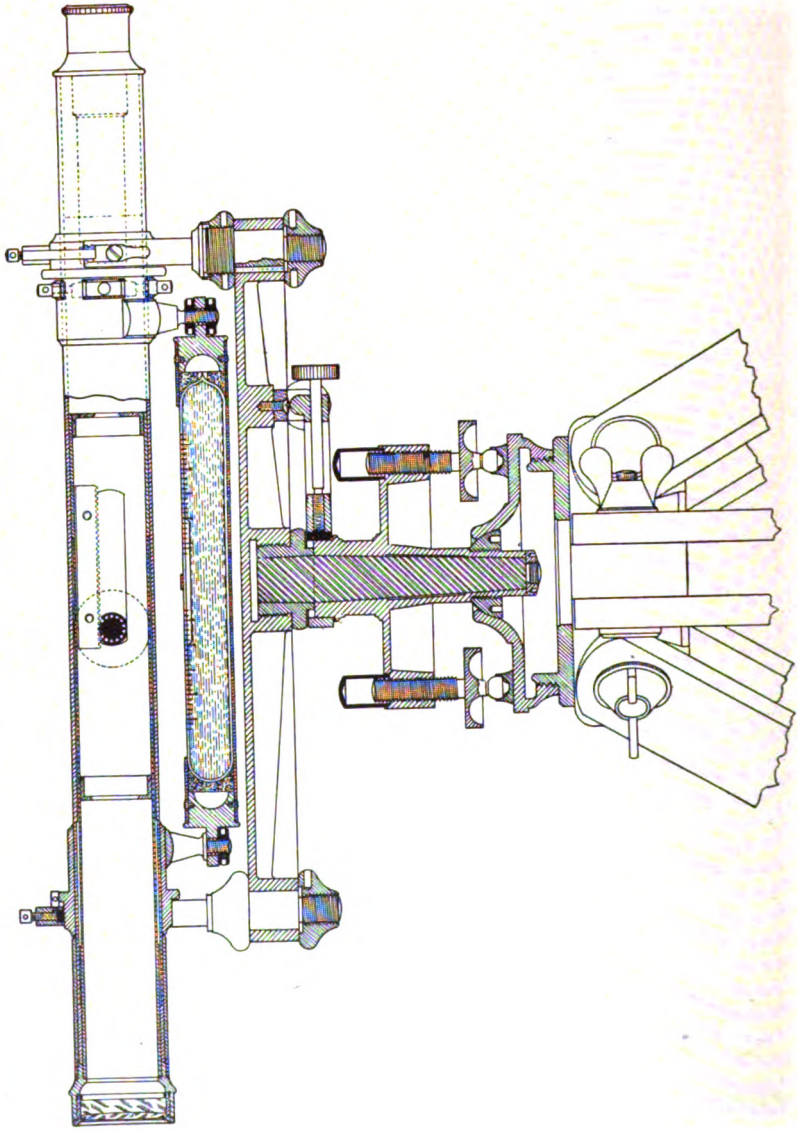

CROSS SECTION OF THE DIETZGEN WYE LEVEL

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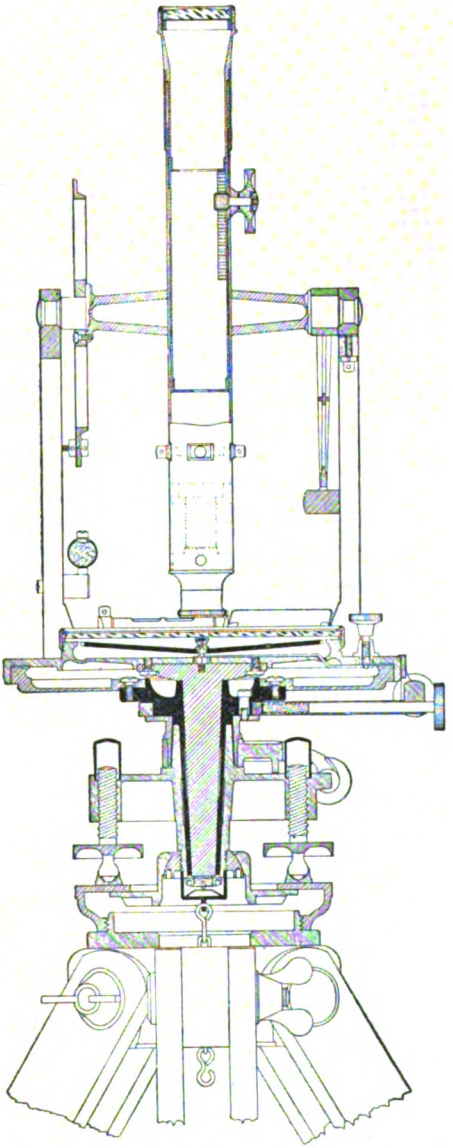

CROSS SECTION OF THE DIETZGEN TRANSIT

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GENERAL CONSTRUCTION

In conclusion, we wish to call attention to our method of construction, by means of which, while attaining great rigidity, we are able to eliminate all unnecessary weight in the various parts of the instrument.

By referring to the cross-sectional cuts of our Engineers' Transit and the Y Level, it will be seen that all we claim for our instruments has been accomplished in a perfected mechanical manner, and that the protection and accessibility of all the vital parts is a particular feature.

We use selected and exceptionally hard bell metal for the centers, Y level telescope bearings and telescope axis; phosphor bronze for the outer center, and hard composition for the parallel plate. By the use of these metals, expansion and contraction is reduced to a minimum, and the liability of injury and fretting of the moving parts — which constantly exists when soft or hammered brass is used — is practically overcome, thus enabling more reliable and permanent adjustments to be made.

Aluminum alloys in the manufacture of our instruments are, owing to their softness and ill-wearing properties, used only for those parts subject to little wear and which do not affect the accuracy. The injudicious use of aluminum in surveying instruments would, while obtaining lightness, sacrifice strength and stability.

CARE OF INSTRUMENTS

As with proper care the usefulness of an instrument can be preserved for many years, we feel that it would not be amiss to mention, for the benefit of our friends and patrons, a few points regarding the care of instruments.

The lenses of the telescope, particularly the object glass, should not be removed, as this will disturb the adjustment. If necessary to clean them, great care should be taken and only soft, clean linen should be used.

To retain the sensibility of the compass needle, the delicate point on which it swings must be carefully guarded, and the instrument should not be carried without the needle being fastened. When the needle is lowered it should be brought gently upon the center pin.

The object slide seldom needs to be removed, but when removing is necessary, the slide should be carefully protected from dust. Do not grease or oil the slide too freely, as only a thin film is necessary. Any surplus oil should be removed with a clean wiper.

The centers, which receive considerable wear, require more frequent lubrication. After thoroughly cleaning, they should be carefully oiled with a fine watch oil.

All of the adjusting screws should be brought to a firm bearing, but never tightened to such a degree that a strain is applied to the different parts, as, in such instances, the adjustment is very unreliable.

When the instrument is carried on the tripod all clamps should be tightened to prevent unnecessary wear on the centers.

The outer appearance of the instrument will be preserved by using a camel's hair brush to remove the dust. If any oxyd has accumulated, due to long exposure to salt air, watch oil should be applied to the affected parts, allowed to remain for several hours and then removed. Water spots may be removed in a similar manner.

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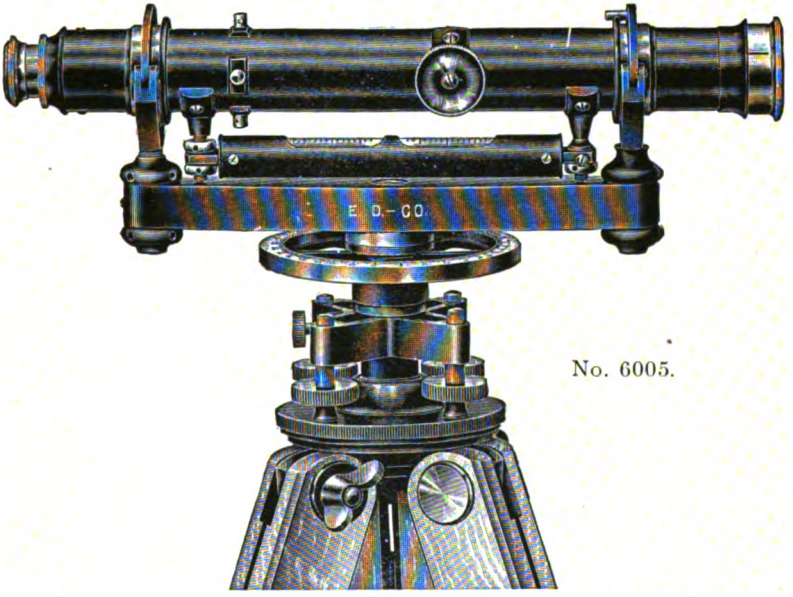
ARCHITECTS' LEVEL

Each Instrument of our make warranted to be first-class in every particular.



No. 6005.

Architects' Level, as shown above, is of superior quality and of the same accurate workmanship as our larger levels. This instrument will be found highly serviceable for Architects' and Contractors' use, and for tile draining and other operations where lines are to be run with the stations but a short distance apart.

SPECIFICATIONS

Telescope — Length, 11½ inches; magnifying power, 18 diameters; achromatic terrestrial, of good definition; focused by rack and pinion; eye-piece provided with a screw-like arrangement for precise focusing of cross hairs.

Level to Telescope — Length, 5 inches; graduated on the glass.

Cross Bar — Length, 8 inches; best composition metal.

Wyes — Provided with our new *locking device* (patented), which securely fastens the clips, dispensing with the ordinary locking pin and cord attachment.

Horizontal Circle — Diameter, 3 inches; graduated to degrees, numbered 0 to 90 each way, with vernier reading to 5 minutes.

Parallel Plates — Of large diameter, the upper plate consisting of four well-braced arms; *four* leveling screws; provided with clamp to spindle.

Finish — Bronzed and lacquered.

Weight — Instrument, 5 pounds; tripod, 6 pounds.

The Instrument is packed whole and stands erect in a nicely finished mahogany box, which is provided with a lock and strong leather strap, and contains a metal trivet (for setting level where use of tripod is difficult), adjusting pins, plumb bob and sun-shade.

No. 6005. Architects' Level, with tripod No. 6202, box, etc., Each, $45 00

6006. Architects' Level, like No. 6005, but with *tangent screw;* tripod No. 6202, box, etc. . . . . Each, 50 00

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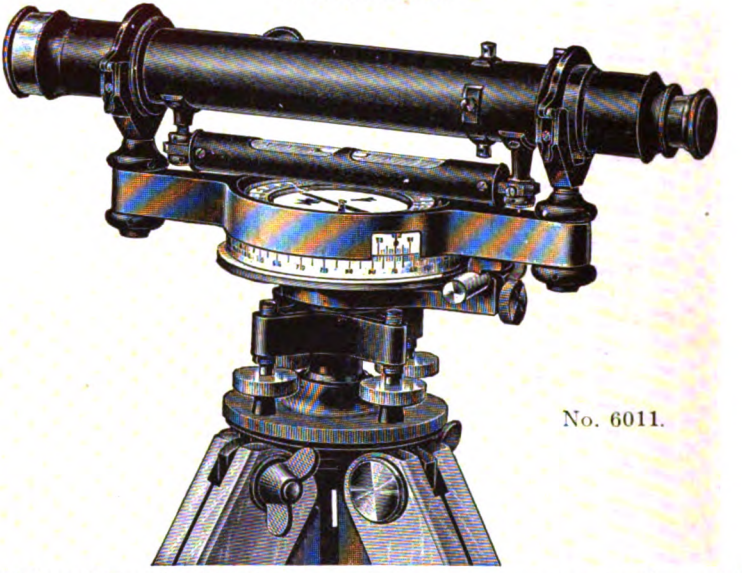
ARCHITECTS' LEVEL

WITH COMPASS



No. 6011.

Architects' Level with *Compass*, of the same accurate workmanship as Architects' Level No. 6005, but fitted with a *compass*, so arranged that it adds practically nothing to the weight or size of the instrument, while it affords a ready means of determining the bearing of lines or of measuring angles by the needle.

SPECIFICATIONS

Telescope — Length, 11½ inches; magnifying power, 18 diameters; achromatic terrestrial, of good definition; focused by rack and pinion; eyepiece provided with a screw-like arrangement for precise focusing of cross hairs.

LEVEL TO TELESCOPE — Length, 5 inches; graduated on the glass.

Cross Bar — Length, 8 inches; best composition metal.

WYES — Provided with our new *locking device* (patented), which securely fastens the clips, dispensing with the ordinary locking pin and cord attachment.

Compass — Graduated to half-degrees, figured from 0 to 90 on each side of North and South; graduation and inside face of compass *silvered;* magnetic needle, 3 inches, hardened and tempered steel.

Horizontal Circle — Diameter, 3⅝ inches; graduated to degrees, numbered 0 to 90 each way, with vernier reading to 5 minutes.

Parallel Plates — Of large diameter, the upper plate consisting of four well-braced arms; *four* leveling screws; provided with clamp to spindle.

Finish — Bronzed and lacquered.

Weight — Instrument, 5 pounds; tripod, 6 pounds.

The Instrument is packed whole and stands erect in a nicely finished mahogany box, which is provided with a lock and strong leather strap, and contains a metal trivet (for setting Level where use of tripod is difficult), adjusting pins, plumb bob and sun-shade.

No. 6010.	Architects' Level with Compass, with tripod No. 6202, box, etc., ... Each,	$60 00
6011.	Architects' Level with Compass, like No. 6010, but with *tangent screw;* tripod No. 6202, box, etc., . . . Each,	65 00

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CONVERTIBLE ARCHITECTS' LEVEL

No. 6013.

Convertible Architects' Level, as shown above, permits of a wider range of work than can be done with the ordinary Architects' Level, the construction being such that objects above or below a horizontal plane can be sighted.

The instrument is provided with rigid *U-shaped standards* so constructed that they can be attached to the cross bar by means of a large screw, and held firmly in position by two fixed pins. When the instrument is to be used for taking vertical sights, the standards are erected on the cross bar, and the telescope, which has a *permanently fixed axis*, placed in them. In this position the telescope can be moved in altitude, so that vertical sights to the extent of 45 degrees each way can be taken and horizontal angles between two points not in the same plane determined.

The standards are removable and when the instrument is used as a level can be detached and placed in the box.

This Convertible Architects' Level is superior to any other form, as the vertical sight arrangements are of simple and rigid construction, easily and quickly attached; and the *axis* of the telescope being *permanently fixed*, it *cannot get out of alignment*.

SPECIFICATIONS

Telescope — Length, 11½ inches; magnifying power, 18 diameters; achromatic terrestrial, of good definition; focused by rack and pinion; eye-piece provided with a screw-like arrangement for precise focusing of cross hairs.

HORIZONTAL AXIS — Hardest bell metal; *permanently fixed*, insuring accuracy.

LEVEL TO TELESCOPE — Length, 5 inches; graduated on the glass.

Cross Bar — Length, 8 inches; best composition metal.

WYES — Provided with our new *locking device* (patented), which securely fastens the clips, dispensing with the ordinary locking pin and cord attachment.

Tangent Screw — Phosphor bronze; improved form, with opposing spiral spring; well protected but accessible to either hand.

Horizontal Circle — Diameter, 3 inches; graduated to degrees, numbered 0 to 90 each way, with vernier reading to 5 minutes.

Parallel Plates — Of large diameter, the upper plate consisting of four well-braced arms; *four* leveling screws; provided with clamp to spindle.

Finish — Standards and cross bar, cloth-finished; all other parts bronzed and lacquered.

Weight — Instrument, 6 pounds; tripod, 6 pounds.

The Instrument is packed whole and stands erect in a nicely finished mahogany box, which is provided with a lock and strong leather strap, and contains a metal trivet (for setting Level where use of tripod is difficult), adjusting pins, plumb bob and sun-shade.

No. 6013. Convertible Architects' Level, with tripod No. 6202, box, etc., ... Each, $60 00

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CONVERTIBLE ARCHITECTS' LEVEL

WITH COMPASS

No. 6014.

Convertible Architects' Level with *Compass*, as illustrated above, is of the same construction and workmanship as our No. 6013 Level, but fitted with a *compass*, so arranged that it adds practically nothing to the weight or size of the instrument, while it affords a ready means of determining the bearing of lines or of measuring angles by the needle.

SPECIFICATIONS

Telescope — Length, 11½ inches; magnifying power, 18 diameters; achromatic terrestrial, of good definition; focused by rack and pinion; eye-piece provided with a screw-like arrangement for precise focusing of cross hairs.

HORIZONTAL AXIS — Hardest bell metal; *permanently fixed*, insuring accuracy.

LEVEL TO TELESCOPE — Length, 5 inches; graduated on the glass.

Cross Bar — Length, 8 inches; best composition metal.

WYES — Provided with our new *locking device* (patented), which securely fastens the clips, dispensing with the ordinary locking pin and cord attachment.

Tangent Screw — Phosphor bronze; improved form, with opposing spiral spring; well protected but accessible to either hand.

Compass — Graduated to half-degrees, figured from 0 to 90 on each side of North and South; graduation and inside face of compass *silvered*; magnetic needle, 3 inches, hardened and tempered steel.

Horizontal Circle — Diameter, 3⅝ inches; graduated to degrees, numbered 0 to 90 each way, with vernier reading to 5 minutes.

Parallel Plates — Of large diameter, the upper plate consisting of four well-braced arms; *four* leveling screws; provided with clamp to spindle.

Finish — Standards and cross bar, cloth-finished; all other parts bronzed and lacquered.

Weight — Instrument, 6½ pounds; tripod, 6 pounds.

The Instrument is packed whole and stands erect in a nicely finished mahogany box, which is provided with a lock and strong leather strap, and contains a metal trivet (for setting Level where use of tripod is difficult), adjusting pins, plumb bob and sun-shade.

No. 6014. Convertible Architects' Level with Compass, with tripod No. 6202, box, etc., ... Each, $75 00

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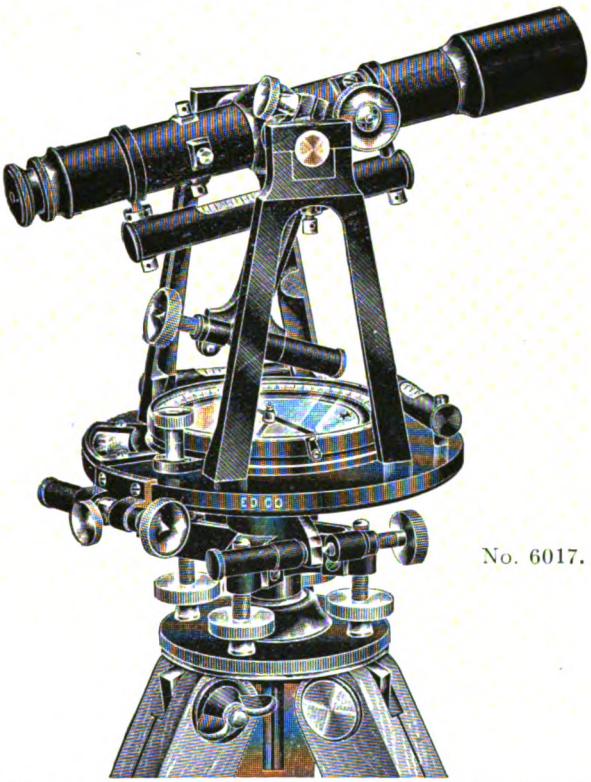
BUILDERS' TRANSIT



No. 6017.

The Builders' Transit has been designed to meet the demand for a low-priced and reliable combination transit and level for Builders' use. It is especially serviceable in work that requires the determination of points in a vertical plane above or below the level line, or for the repetition of angles.

SPECIFICATIONS

Telescope — Length, 8 inches; magnifying power, 16 diameters; achromatic terrestrial, of good definition; focused by rack and pinion; eye-piece provided with a screw-like arrangement for precise focusing of cross hairs.

LEVEL TO TELESCOPE — Length, 4½ inches; graduated on the glass.

Horizontal Circle — Diameter, 5 inches; reads to degrees; graduated on brass, *silvered*.

Vernier — One, reading to 2 minutes; vernier plate fitted with two spirit levels placed at right angles to each other.

Tangent Screws — Phosphor bronze; improved form, with opposing spiral spring.

Parallel Plates — Of large diameter, the upper plate consisting of four well-braced arms; *four* leveling screws; provided with clamp to spindle.

Finish — Standards, cloth-finished; all other parts bronzed and lacquered.

Weight — Instrument, 6 pounds; tripod, 6 pounds.

The Instrument is packed whole and stands erect in a nicely finished mahogany box, which is provided with a lock and strong leather strap, and contains sun-shade, plumb bob, adjusting pin and screw-driver.

No. 6015.	Builders' Transit, with tripod No. 6202, box, etc., Each,	$ 85 00
6017.	Builders' Transit, like No. 6015, but having *compass* with raised ring, silvered, graduated to degrees, with variation plate, needle about 3 inches; tripod No. 6202, box, etc., ... Each,	105 00

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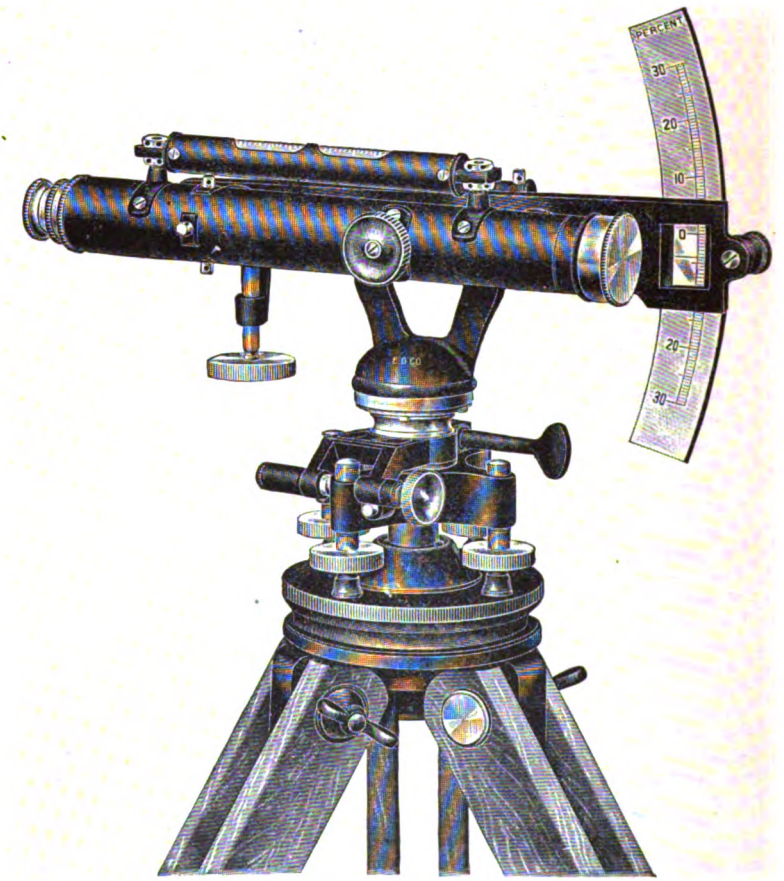
PERCENTER LEVEL

(Patent applied for)

Each Instrument of our make warranted to be first-class in every particular.



No. 6020.

Percenter Level, as illustrated above, is something new in an Engineering instrument, the construction being based upon the mathematical theorem that like sides in similar triangles bear the same relation to each other. It has a broad field of usefulness, and has met with the approval of many eminent engineers.

For complete specifications, see next page.

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PERCENTER LEVEL *Continued*

The Percenter Level has been designed to afford a ready means of determining, quickly and accurately, and with but *one operation*, the grade *per cent* between any two points, without measuring the distance between the same and without any calculation or reference to tables.

In using the Percenter Level, it is necessary only to send a rodman to the point of which the grade is to be determined, and in *one observation*, taking but a moment's time, the grade can be found by a *direct* reading on the graduated arc of the instrument.

The Instrument is practical and thoroughly reliable, and will be found especially serviceable for use by railroad engineers and road builders on preliminary work. For the rapid determination of grades, cuts and fills, setting of stakes, irrigation work, etc., it is unequaled. It can also be used in place of the regular Dumpy Level.

SPECIFICATIONS

Telescope — Length, 11½ inches; magnifying power, 22 diameters; achromatic terrestrial, of good definition; focused by rack and pinion; stadia hairs; eye-piece provided with a screw-like arrangement for precise focusing of cross-hairs; substantial, rigid supports.

LEVEL TO TELESCOPE — Length, 5 inches; graduated on the glass, indicating a variation of 30 seconds of arc to $\frac{1}{10}$ inch motion of the bubble.

Telescope Bar — A strong, well-ribbed bar, to which the telescope is securely attached; provided at one end with a pointer for indicating the grade on the Percenter arc.

LEVEL TO BAR — Length, 4 inches; graduated on the glass, indicating a variation of 30 seconds of arc to $\frac{1}{10}$ inch motion of the bubble.

Arc — Silvered; divisions of ¼ per cent for 30 per cent elevation and depression.

Center — Special design, combining strength and accuracy.

Parallel Plates — Of large diameter, the upper plate consisting of four well-braced arms; *four* leveling screws; provided with clamp and tangent screw to spindle.

Finish — Bronzed and lacquered.

Weight — Instrument, 7 pounds; tripod, 8 pounds.

The Instrument is packed whole and stands erect in a nicely finished mahogany box, which is provided with a lock and strong leather strap, and contains a sun-shade, plumb bob and adjusting pin.

No. 6020. Percenter Level, with split-leg tripod No. 6204, box, etc., Each, ... $140 00

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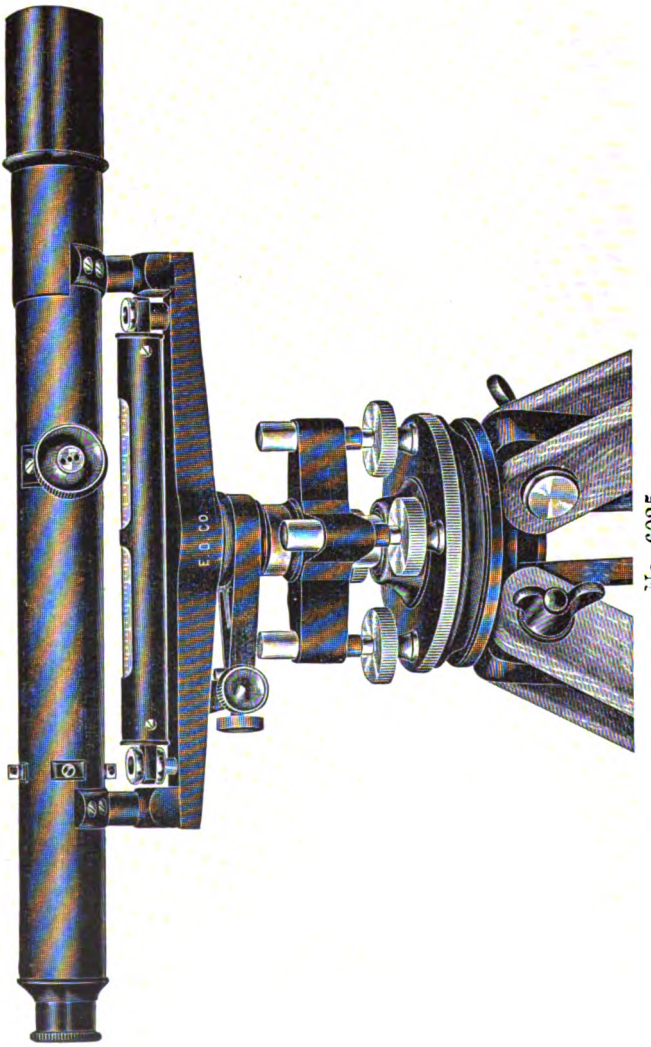
ENGINEERS' DUMPY LEVEL

Each Instrument of our make warranted to be first-class in every particular.



No. 6025.

Engineers' Dumpy Level, as shown above, is of simple and compact construction, possessing all the good qualities of the best Y Level; powerful telescope, long sensitive level vial and stability.

While the adjustment of the Y Level is easier, the Dumpy Level, having fewer parts, will retain its adjustment longer.

For complete specifications, see next page.

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ENGINEERS' DUMPY LEVEL *Continued*

SPECIFICATIONS

Telescope — Length, 15 inches; magnifying power, 28 to 30 diameters; achromatic terrestrial, powerful and of best definition; object slide and eye-piece provided with *dust protectors*

OBJECT GLASS — Diameter, 1⅜ inches, used to its full value.

EYE PIECE — Improved style, giving a large, flat field; provided with a screw-like arrangement for precise focusing of cross hairs.

Cross Bar — Length, 10 inches; best composition metal; designed to combine *lightness* with *strength*, provided with clamp and tangent screw; substantial telescope supports.

LEVEL TO CROSS BAR — Length, 7 inches; graduated on the glass; highly sensitive, indicating a variation of 20 seconds of arc to $\frac{1}{10}$ inch motion of the bubble. A bubble of this sensitiveness will be of good service only with an instrument perfectly steady, and provided with a powerful and sharply defining telescope.

Center — Made of best quality tool steel, extending from the cross bar to the bottom of the lower parallel plate, insuring highest accuracy and durability.

Parallel Plates — Of extra large diameter, enabling the application of a more sensitive bubble than is generally found.

FOUR LEVELING SCREWS — Phosphor bronze, of one solid piece, with accurately cut threads; provided with dust caps and ball and socket cups.

Finish — Bronzed and lacquered.

Weight — Instrument, 7½ pounds; tripod, about 8 pounds.

The Instrument is packed whole and stands erect in a nicely finished mahogany box, which is provided with lock, hooks, strong leather strap and contains sun-shade and adjusting pins.

No. 6025. Engineers' Dumpy Level, with split-leg tripod No. 6204, box, etc., ... Each, $100 00

6026. Engineers' Dumpy Level, like No. 6025, but *without tangent screw*; split-leg tripod No. 6204, box, etc., . Each, 90 00

6027. Engineers' Dumpy Level, like No. 6025, but with *18-inch* telescope and magnifying power 32 diameters; split-leg tripod No. 6204, box, etc., ... Each, 110 00

The above Levels made to order with *inverting eye-piece*, without additional charge.

For lower priced Instruments, see Railroad Dumpy Levels, Nos. 6125-6126.

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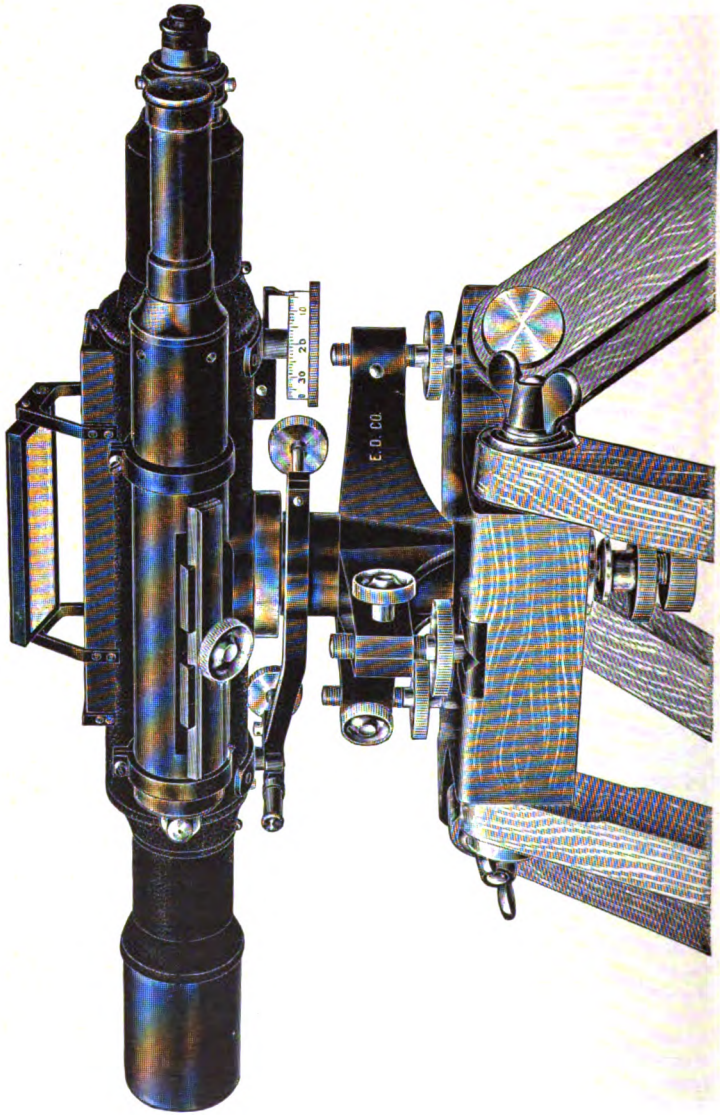
PRECISION LEVEL

(Patterned after the U. S. C. & G. Survey Level)



No. 6028.

For complete specifications, see next page.

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PRECISION LEVEL

Continued

The Precision Level, as shown on preceding page, is a decided departure from all other precise level designs. The final adjustment of the line of collimation is accomplished by a micrometer screw at the eye-end of the telescope, and not by means of three or four leveling screws, as on other levels. More accurate and rapid results, under all conditions, can be obtained with this instrument than with any other level.

Observations on both the rod and the level can be made at the same time, without any change in the position of the observer. The rod is visible while looking, with the right eye, through the main telescope, and at the same time the motion of the bubble in the level reading tube is observed with the left eye, and the reading of the rod is made at the instant the telescope, by means of the micrometer screw, has been adjusted so that the bubble is at the center of the graduations.

On account of the prismatic level reading attachment the instrument can be set at a height which permits views to be taken by the observer while standing perfectly erect.

Owing to the careful selection of metals for those parts upon which depends the relation and the accuracy between the line of collimation and the spirit level, the co-efficient of expansion of these parts is as nearly equal to that of glass as is possible to attain with any alloy of metals.

SPECIFICATIONS

Telescope — Length, 18 inches; magnifying power, 20 or 30 diameters; achromatic inverting, with improved rack and pinion movement; the middle part of the telescope is embedded in a tubular support and is held therein by two pivot screws, near the object end of the telescope, which form a horizontal axis for the telescope; the other end is supported by a micrometer screw towards the eye-end of the telescope. This arrangement permits of a movement of the telescope within its tubular encasing in altitude. Opposing the movement of the micrometer screw, and arranged between the top of the telescope and the tubular encasing, is placed a spring, which prevents jarring of the telescope in its tube-shaped support. When the instrument is not in use the telescope is raised off the micrometer screw by a lever which gently presses it against the spring. The metal used for the telescope and telescope support is nickel-iron.

Object Glass — Diameter, 1¼ inches, used to its full value; object glass mounting, nickel-iron.

Eye-Piece — Improved style, giving a large, flat field; provided with a screw-like arrangement for precise focusing of cross hairs; eye-piece mounting, nickel iron.

Micrometer Screw — Made of nickel-steel; the point is glass hard; the head is divided into 100 parts.

Cross Hair Arrangement — Consists of one vertical and three horizontal hairs of the finest spider webs; the upper and lower hair will intercept a space of 30 cm. at a distance of 100 m. — if so desired they can be arranged for readings 1 : 100; the cross hair diaphragm is of nickel-iron.

Quick Leveling Attachment — Consists of a circular spirit level with a reflector; attached to the right-hand side of the telescope, and will aid in approximately leveling up the base of the instrument.

Level to Telescope — One of the most important parts; length, 5 inches, of the *chambered type*, graduated on the glass; highly sensitive, indicating a variation of 2 seconds of arc to 2 mm. motion of the bubble; placed in a recess on top of the telescope and as close to the line of sight as possible, fully protected by the tubular telescope, which has an opening for the length of the level vial; the movements of the bubble are reflected in a mirror placed over the level vial, and from here they are reflected into the prismatic level reading attachment.

Level Reading Attachment — Consists of a tube, similar to a telescope, placed parallel to the telescope whose eye-end will about correspond with the eye-piece of the telescope, and to which are mounted two sliding prisms. To adjust these prisms accurately to the length of the bubble, which varies with temperature changes, their relative position to each other can be changed by means of a milled thumb screw; the movement of the bubble, which is reflected in these prisms, is read with the left eye, at the eye-end of the tube, while with the right eye, the distant rod is seen through the telescope; the distance between the level reading tube and the telescope is adjustable to the distance between the eyes of the observer.

Tangent Screw — German silver; improved form, with opposing spring; well protected but accessible to either hand.

Center — Special design, of the best grade of tool steel, hardened to the greatest degree; the socket into which the center fits is a perfect, close-grained, soft iron casting.

Parallel Plates — Made of fine-grained cast iron; extra strong and of compact design.

Three Leveling Screws — Finest tool steel, hardened; accurately cut threads.

Finish — Telescope, tubular telescope support and tube of the reading attachment, cloth-finished; all other parts covered with hard but elastic black enamel.

Weight — Instrument, about 12 pounds; special tripod, about 15 pounds.

The Instrument is packed complete in a nicely finished mahogany box, which is provided with lock, hooks, strong leather strap and contains sun-shade, plumb bob and adjusting pins.

No. 6028. Precision Level, with extra strong split-leg tripod, box, etc., ... Each, $300 00

6029. Precision Level, like No. 6028, but with *folding mirror* on top of telescope for level readings and *without* prismatic level reading tube; extra strong split-leg tripod, box, etc., Each, 250 00

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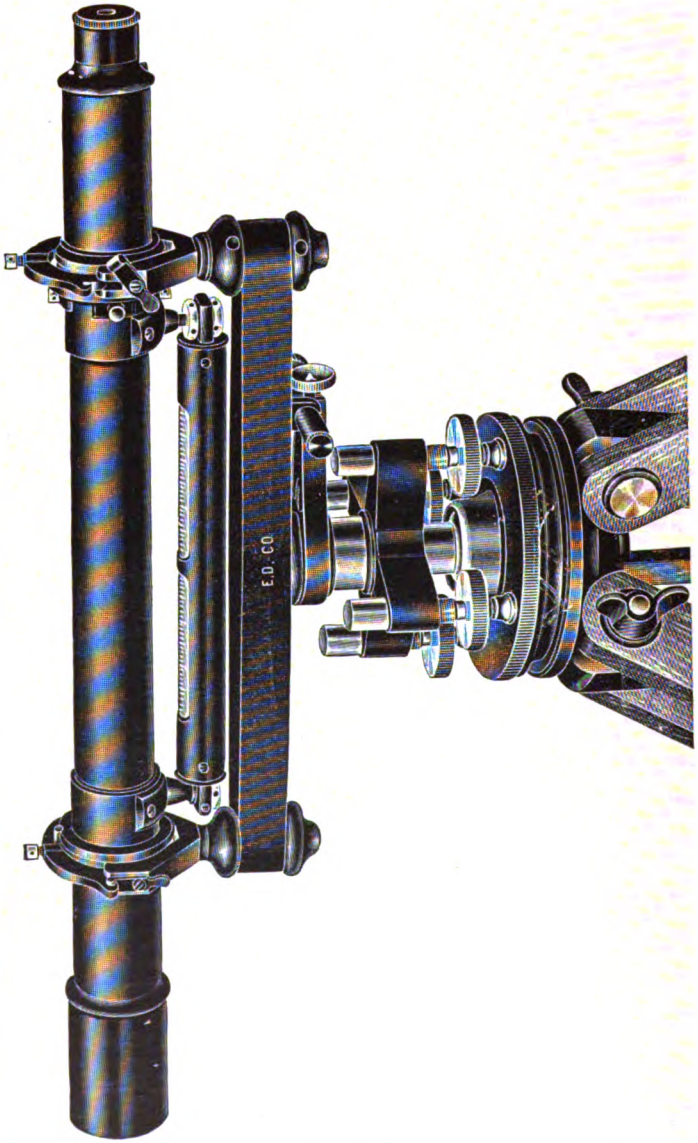
ENGINEERS' Y LEVEL

Each Instrument of our make warranted to be first-class in every particular.



No. 6030.

Engineers' Y Level, as illustrated above, possesses the features of stability, a powerful telescope and a sensitive bubble. The materials employed are of the best, the lenses of the finest quality, and the workmanship and finish of the highest order.

For complete specifications, see next page.

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ENGINEERS' Y LEVEL *Continued*

SPECIFICATIONS

Telescope — Length, 18 inches; magnifying power, 33 to 35 diameters; achromatic terrestrial, powerful and of best definition; provided with a vertical stop, so as to bring the cross hairs in a true vertical and horizontal position; line of collimation true for all distances; object slide and eye-piece provided with *dust protectors;* collars of hardest bell metal, truly cylindrical and of equal diameter, attached permanently to the telescope.

OBJECT GLASS — Diameter, $1\frac{3}{8}$ inches, used to its full value.

EYE-PIECE — Improved style, giving a large, flat field; provided with a screw-like arrangement for precise focusing of cross hairs.

LEVEL TO TELESCOPE — Length, 8 inches; graduated on the glass; highly sensitive, indicating a variation of 20 seconds of arc to $\frac{1}{10}$ inch motion of the bubble. A bubble of this sensitiveness will be of good service only with an instrument perfectly steady, and provided with a powerful and sharply defining telescope.

Cross Bar — Length, 12 inches; best composition metal.

WYES — Provided with our new *locking device* (patented), which securely fastens the clips, holding the telescope in a firm position, dispensing with the ordinary locking pin and cord attachment.

Center — Made of best quality tool steel; extends from the cross bar to the bottom of the lower parallel plate, thus increasing the strength, accuracy and stability of the instrument. The steel center overcomes the liability of bending the spindle, so common with instruments in which this part is of brass.

Tangent Screw — Phosphor bronze; improved form, with opposing spiral spring; well protected but accessible to either hand.

Parallel Plates — Of extra large diameter, enabling the application of a more sensitive bubble than is generally found; the upper plate consists of four well-braced arms.

FOUR LEVELING SCREWS — Phosphor bronze, of one solid piece, with accurately cut threads; provided with dust caps and ball and socket cups.

Finish — Bronzed and lacquered.

Weight — Instrument, 11 pounds; tripod, about 9 pounds.

The Instrument is packed whole and stands erect in a nicely finished mahogany box, which is provided with lock, hooks, strong leather strap and contains sun-shade and adjusting pins.

No. 6030.	Engineers' Y Level, with split-leg tripod No. 6205, box, etc., ... Each,	$140	00
6031.	Engineers' Y Level, like No. 6030, but with *reversion* level; split-leg tripod No. 6205, box, etc., ... Each,	150	00
6032.	Engineers' Y Level, like No. 6030, but with *three* leveling screws and extra large tripod head; special split-leg tripod, box, etc., ... Each,	150	00
6033.	Engineers' Y Level, like No. 6030, but with *20 inch* telescope; split-leg tripod No. 6205, box, etc., . . Each,	145	00
6034.	Engineers' Y Level, like No. 6030, but with *22 inch* telescope; split-leg tripod No. 6205, box, etc., . . . Each,	150	00

The above Levels made to order with *inverting eye-piece*, without additional charge.

For lower priced Instruments, see Railroad Y Levels Nos. 6130-6134.

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PLAIN ENGINEERS' TRANSIT

Each Instrument of our make warranted to be first-class in every particular.

No. 6035.

Plain Engineers' Transit, as illustrated above, is our standard size for general engineering, and will meet the requirements of the highest class of engineering, such as hydraulic, bridge building, city and land surveying.

In stadia measurements, which method is now more extensively used, especially by railroad engineers in rough country, where it will give better results than chaining, our new telescope will be of special service.

For complete specifications, see next page.

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PLAIN ENGINEERS' TRANSIT *Continued*

See also General Description, pages 409-418.

SPECIFICATIONS

Telescope — Length 11¼ inches; magnifying power, 26 diameters; achromatic terrestrial, powerful and of best definition; balanced, and reverses at both ends; line of collimation true for all distances; object slide and eye-piece provided with *dust protectors.*

OBJECT GLASS — Diameter, 1¼ inches, used to its full value.

EYE-PIECE — Improved achromatic with abundance of light, giving a large, flat field.

HORIZONTAL AXIS — Length, 6 inches; hardest bell metal, cast hollow to reduce weight, with extra large bearings; center point on top to permit accurate centering from above.

Standards — Phosphor bronze; rigid, and ribbed to reduce weight.

Horizontal Circle — Diameter, 6½ inches to edge of graduation; graduated on *solid silver*, with exceptionally legible lines of uniform thickness; marked with two rows of figures, one reading from 0 to 180 and the other from 0 to 360; figures inclined in the direction they are to be read.

Verniers —Two, double and exactly opposite, reading to 30 seconds; placed at an angle of 30° to line of sight; graduated on *solid silver;* covered with polished plate glass and provided with ground glass shades.

Compass — Graduated to half degrees, figured from 0 to 90 on each side of North and South; graduation and inside face of compass *silvered;* magnetic needle, 4½ inches, hardened and tempered steel, jewel center.

Plate Levels — Length, 2¼ inches; ground extra sensitive, indicating a variation of 40 seconds of arc to $\frac{1}{10}$ inch motion of the bubble.

Tangent Screws — Phosphor bronze; improved form, with opposing spiral spring; well protected but accessible to either hand.

Center — Compound, the inner one is made of bell metal; the intermediate, of gun metal; the outer, of phosphor bronze; extra long, perfectly tapered and fitted.

Parallel Plates — Of extra large diameter, the upper plate consisting of four well-braced arms.

FOUR LEVELING SCREWS — Phosphor bronze, of one solid piece, with accurately cut threads; provided with dust caps and ball and socket cups.

SHIFTING CENTER — Range of shift, ⅞ inch.

Finish — Bronzed and lacquered.

Weight — Instrument, 12½ pounds; tripod, about 9 pounds.

The Instrument is packed whole and stands erect in a nicely finished mahogany box, which is provided with lock, hooks, strong leather strap and contains sun-shade, plumb bob, screw-driver, magnifying glass and adjusting pins.

No. 6035. Plain Engineers' Transit, with split-leg tripod No. 6205, box, etc., ... Each, $195 00

6036. Plain Engineers' Transit, like No. 6035, but with *clamp* and *tangent screw* to telescope axis; split-leg tripod No. 6205, box, etc., ... Each, 205 00

The above Instruments made to order with *inverting eye-piece*, or verniers reading to *single minutes*, without additional charge.

For Accessories, see page 479.

For lower priced Instruments, see Railroad Transits Nos. 6135-6155.

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ENGINEERS' TRANSIT

WITH LEVEL ATTACHMENT

Each Instrument of our make warranted to be first-class in every particular.

No. 6045.

No. 6045. Engineers' Transit, with *Level Attachment* (specifications for No. 6035 also apply to this number); gradienter screw, fixed stadia hairs, ground glass vernier shades, and graduations on *solid silver* reading to 30 seconds; level vial 6 inches long, indicating a variation of 30 seconds of arc to $\frac{1}{16}$ in. motion of the bubble; split-leg tripod No. 6205, box, etc., Each, $230 00

For Accessories, see page 479.

For lower priced Instruments, see Railroad Transits Nos. 6135-6155.

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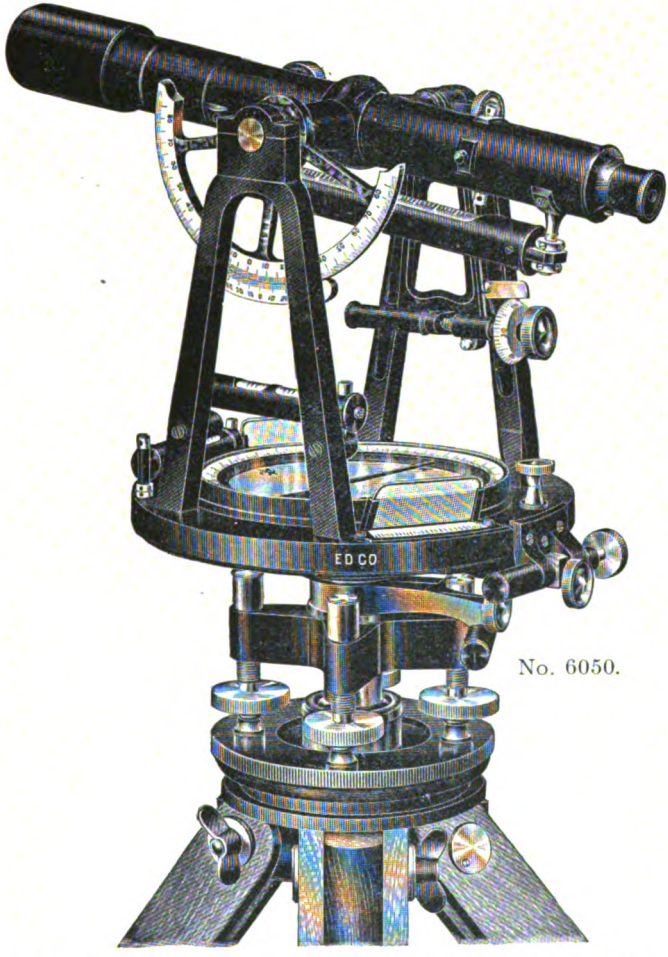
ENGINEERS' TRANSIT

WITH LEVEL ATTACHMENT AND VERTICAL ARC

Each Instrument of our make warranted to be first-class in every particular.



No. 6050.

No. 6050. Engineers' Transit, with *Level Attachment* and *Vertical Arc* 5 in. diam., graduated on *solid silver*, with vernier reading to single minutes (specifications for No. 6035 also apply to this number); gradienter screw, fixed stadia hairs, ground glass vernier shades, and graduations on *solid silver* reading to 30 seconds; level vial 6 inches long, indicating a variation of 30 seconds of arc to $\frac{1}{10}$ in. motion of the bubble; split-leg tripod No. 6205, box, etc., Each, $245 00

For Accessories, see page 479.

For lower priced Instruments, see Railroad Transits, Nos. 6135-6155.

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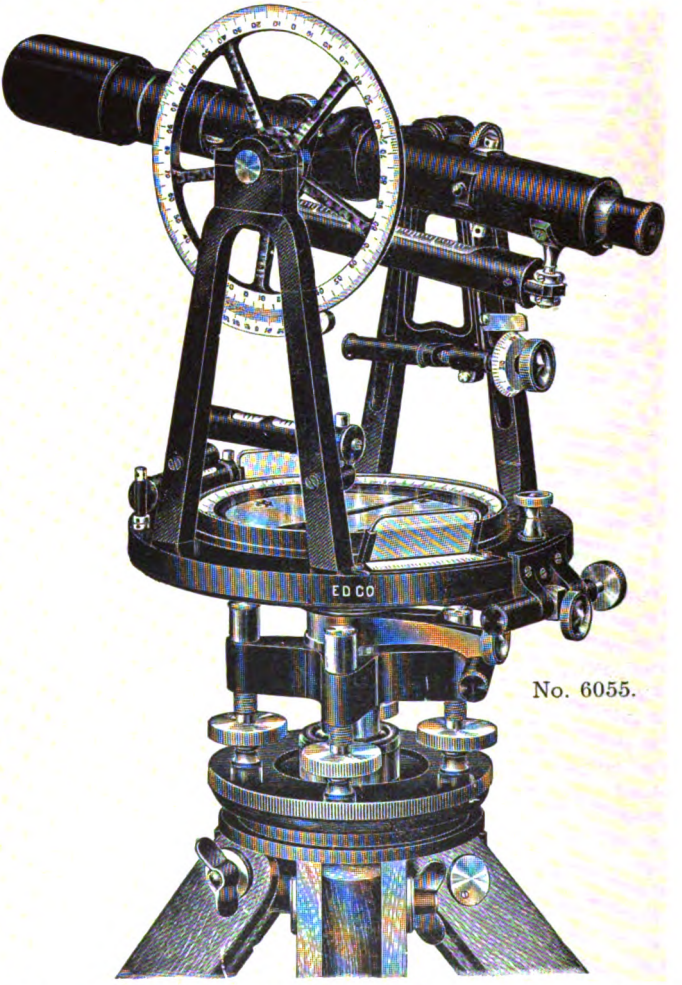
ENGINEERS' TRANSIT

WITH LEVEL ATTACHMENT AND VERTICAL CIRCLE

Each Instrument of our make warranted to be first-class in every particular.



No. 6055.

No. 6055. Engineers' Transit, with *Level Attachment* and *Vertical Circle* 5 in. diam., graduated on *solid silver*, with vernier reading to single minutes (specifications for No. 6035 also apply to this number); gradienter screw, fixed stadia hairs, ground glass vernier shades, and graduations on *solid silver* reading to 30 seconds; level vial 6 inches long, indicating a variation of 30 seconds of arc to $\frac{1}{10}$ in. motion of the bubble; split-leg tripod No. 6205, box, etc., ... Each, $250 00

For Accessories, see page 479.

For lower priced Instruments, see Railroad Transits, Nos. 6135-6155.

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ENGINEERS' AND SURVEYORS' TRANSIT

COMPLETE

No. 6057.

No. 6057. Engineers' and Surveyors' Transit, complete, with *Vertical Arc* 5 in. diam., graduated on *solid silver*, with vernier reading to single minutes (specifications for No. 6035 also apply to this number); improved Solar Attachment, gradienter screw, fixed stadia hairs, and variation plate to needle; split-leg tripod No. 6205, box, etc., ... Each, $305 00

For Accessories, see page 479.

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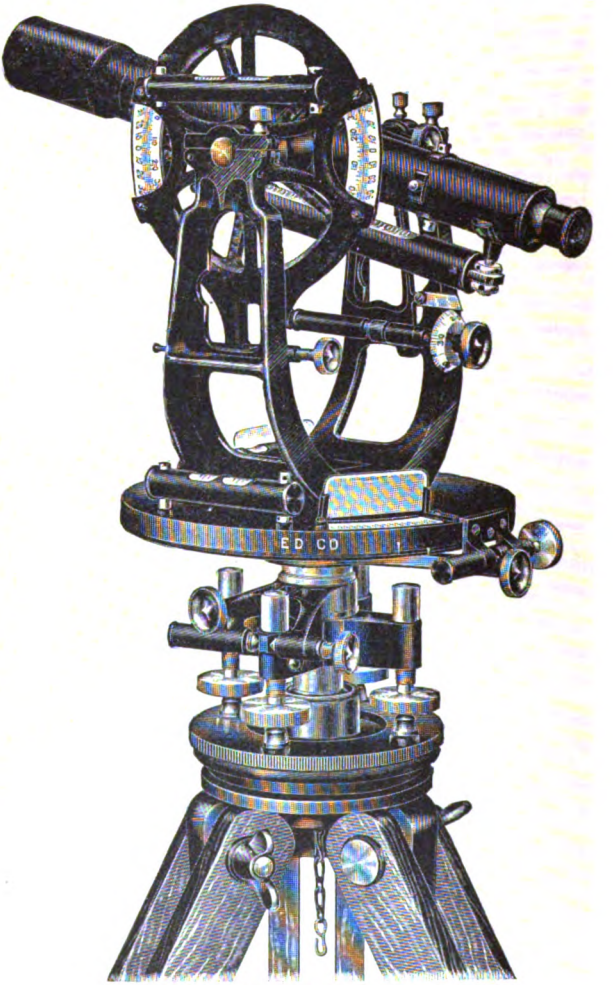
ENGINEERS' TRANSIT THEODOLITE

WITH LEVEL ATTACHMENT AND VERTICAL CIRCLE

Each Instrument of our make warranted to be first-class in every particular.



No. 6058.

Engineers' Transit Theodolite with *U-shaped Standards*, as illustrated above, is of a design embodying great strength in the standards, insuring the greatest steadiness of the telescope.

This Instrument is particularly adapted for city engineering and other work which does not require the use of a magnetic needle, but which demands the highest degree of accuracy.

For complete specifications, see next page.

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ENGINEERS' TRANSIT THEODOLITE *Continued*

SPECIFICATIONS

Telescope — Length, 11¼ inches; magnifying power, 26 diameters; achromatic terrestrial, powerful and of best definition; balanced, and reversible through standards and over bearings; line of collimation true for all distances; object slide and eye-piece provided with *dust protectors;* fixed stadia hairs.

OBJECT GLASS — Diameter, 1¼ inches, used to its full value.

EYE-PIECE — Improved achromatic with abundance of light, giving a large, flat field.

HORIZONTAL AXIS — Length, 6 inches; hardest bell metal, cast hollow to reduce weight; center point on top to permit accurate centering from above.

LEVEL TO TELESCOPE — Length, 5 inches; graduated on the glass; highly sensitive, indicating a variation of 30 seconds of arc to $\frac{1}{10}$ inch motion of the bubble.

Vertical Circle — Diameter, 5 inches; graduated on *solid silver,* verniers reading to single minutes; cloth-finished aluminum guard; fine spirit level.

Standards — U-shaped; cast of the highest quality phosphor bronze, in *one piece;* of compact, graceful design embodying the greatest lateral strength and rigidity.

BEARINGS — Cylindrical, insuring a true motion of the telescope in the vertical plane and eliminating any deflection in the line of sight caused by the rolling in the bearings.

Horizontal Circle — Diameter, 6½ inches to edge of graduation; graduated on *solid silver,* with exceptionally legible lines of uniform thickness; marked with two rows of figures, one reading from 0 to 180 and the other from 0 to 360; figures inclined in the direction they are to be read.

Verniers — Two, double and exactly opposite, reading to 30 seconds; placed at an angle of 30° to line of sight; graduated on *solid silver;* covered with polished plate glass and provided with ground glass shades.

Plate Levels — Length, 2½ inches; ground extra sensitive, indicating a variation of 40 seconds of arc to $\frac{1}{10}$ inch motion of the bubble; placed within the periphery of the plate, thus enabling the use of long sensitive vials and at the same time carefully protecting them from injury.

Tangent Screws — Phosphor bronze; improved form, with opposing spiral spring; well protected but accessible to either hand; telescope tangent screw fitted with gradienter attachment.

Center — Compound, the inner one is made of bell metal; the intermediate, of gun metal; the outer, of phosphor bronze; extra long, perfectly tapered and fitted.

Parallel Plates — Of extra large diameter, the upper plate consisting of four well-braced arms.

FOUR LEVELING SCREWS — Phosphor bronze, of one solid piece, with accurately cut threads; provided with dust caps and ball and socket cups.

SHIFTING CENTER — Range of shift, ⅛ inch.

Finish — Standards and aluminum guard to vertical circle, cloth-finished; all other parts bronzed and lacquered.

Weight — Instrument, 14 pounds; tripod, about 9 pounds.

The Instrument is packed whole and stands erect in a nicely finished mahogany box, which is provided with lock, hooks, strong leather strap and contains sun-shade, plumb bob, screw-driver, magnifying glass and adjusting pins.

No. 6058. Engineers' Transit Theodolite with *U-shaped standards;* split-leg tripod No. 6205, box, etc., ... Each, $270 00

6058½. Engineers' Transit Theodolite, like No. 6058, but with *vertical arc;* split-leg tripod No. 6205, box, etc., Each, 260 00

For Accessories, see page 479.

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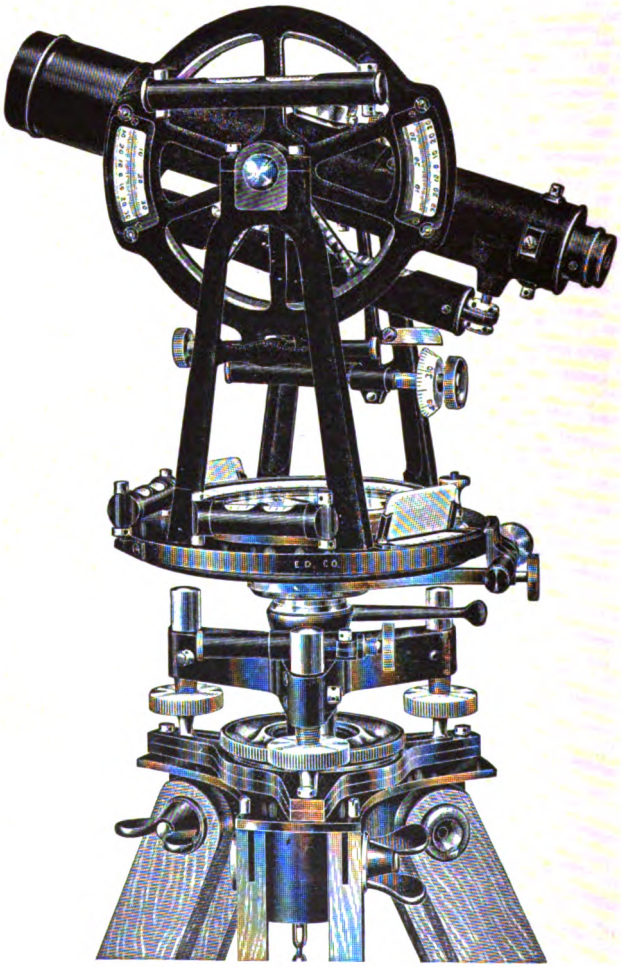
STADIA TOPOGRAPHY TRANSIT

Each Instrument of our make warranted to be first-class in every particular.



No. 6059.

Stadia Topography Transit, as illustrated above, is of the same quality and workmanship as our other high-grade engineering instruments, and has been designed especially for topographical work.

For complete specifications, see next page.

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STADIA TOPOGRAPHY TRANSIT *Continued*

SPECIFICATIONS

Telescope — Length, 11 inches; magnifving power, 24 diameters; powerfu. and of best definition; line of collimation true for all distances; object slide and eye-piece provided with *dust protectors;* fixed stadia hairs

OBJECT GLASS — Diameter, $1\frac{7}{8}$ inches, used to its full value.

EYE-PIECE — Inverting, giving greatly increased illumination, with large flat field.

HORIZONTAL AXIS — Length, 5 inches; hardest bell metal, cast hollow to reduce weight, with extra large bearings; center point on top to permit accurate centering from above.

LEVEL TO TELESCOPE — Length, 6 inches; graduated on the glass; highly sensitive, indicating a variation of 20 seconds of arc to $\frac{1}{10}$ inch motion of the bubble.

Vertical Circle — Diameter, 5 inches; protected by cloth-finished aluminum guard; graduated on *solid silver;* two double and exactly opposite verniers, reading to one minute; provided with tangent screw and fine spirit level, indicating a variation of 20 seconds of arc to $\frac{1}{10}$ inch motion of the bubble.

Standards — Phosphor bronze; rigid, and ribbed to reduce weight.

Horizontal Circle — Diameter, $5\frac{1}{4}$ inches to edge of graduation; graduated on *solid silver* to half-degrees, with exceptionally legible lines of uniform thickness; marked with two rows of figures, one reading from 0 to 90 each side of North and South and the other from 0 to 360; figures inclined in the direction they are to be read.

Verniers — Two, double and exactly opposite, reading to single minutes; placed at an angle of 30° to line of sight; graduated on *solid silver;* covered with polished plate glass and provided with ground glass shades.

Compass — Graduated to half-degrees, figured from 0 to 90 on each side of North and South; graduation and inside face of compass *silvered;* magnetic needle, $3\frac{1}{4}$ inches, hardened and tempered steel, jewel center.

Plate Levels — Length, $2\frac{1}{4}$ inches; ground extra sensitive, indicating a variation of 40 seconds of arc to $\frac{1}{10}$ inch motion of the bubble.

Tangent Screws — Phosphor bronze; improved form, with opposing spiral spring; well protected but accessible to either hand; telescope tangent screw fitted with gradienter attachment.

Center — Compound, the inner one is made of bell metal; the intermediate, of gun metal; the outer, of phosphor bronze; extra long, perfectly tapered and fitted.

Parallel Plates — Of extra large diameter, the upper plate consisting of three well-braced arms.

THREE LEVELING SCREWS — German silver, with accurately cut threads; provided with dust caps.

SHIFTING CENTER — Range of shift, $\frac{1}{4}$ inch; of improved design, without the usual spring commonly furnished with three leveling screw instruments.

Finish — Standards, telescope, level vial casing and aluminum guard for vertical circle, cloth-finished; all other parts bronzed and lacquered.

Weight — Instrument, 10 pounds; extra light mahogany tripod, 7 pounds.

The Instrument is packed whole in a nicely finished mahogany box, which is provided with lock, hooks, strong leather strap and contains sunshade, plumb bob, screw-driver, magnifying glass and adjusting pins.

No. 6059. Stadia Topography Transit, complete, with mahogany split-leg tripod, box, etc., ... Each, $250 00

6059½. Stadia Topography Transit, like No. 6059, but with fine *reversion* level to telescope; mahogany split-leg tripod, box, etc., ... Each, 265 00

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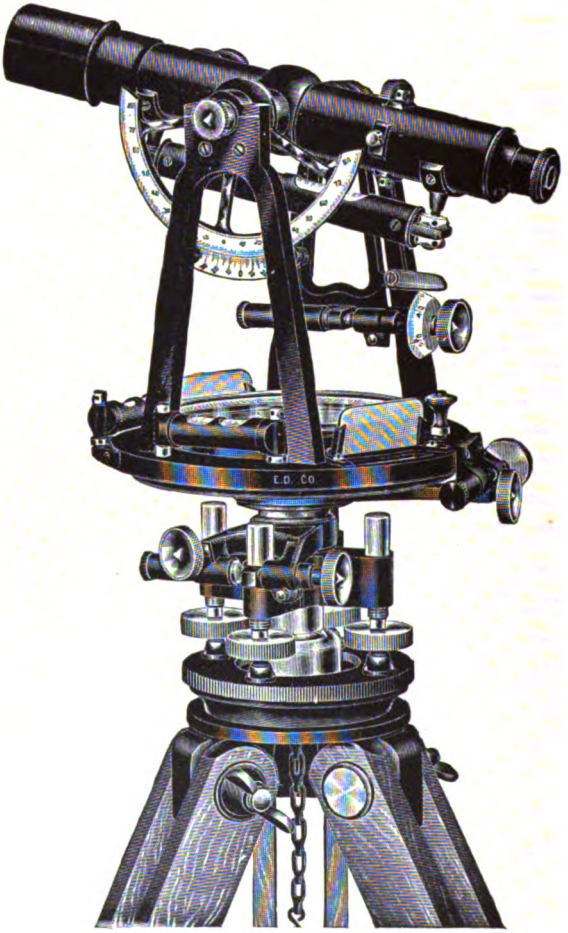
MOUNTAIN AND MINING TRANSIT

Each Instrument of our make warranted to be first-class in every particular.



No. 6060.

Mountain and Mining Transit, as illustrated above, is of the same superior design and accurate workmanship as our No. 6035 Transit, but somewhat smaller in size. The materials used are of the same high grade, and the construction in every way is equal to our larger transits.

For complete specifications, see next page.

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MOUNTAIN AND MINING TRANSIT *Continued*

SPECIFICATIONS

Telescope — Length, 9½ inches; magnifying power, 20 diameters; achromatic terrestrial, powerful and of best definition; balanced, and reverses at both ends; line of collimation true for all distances; object slide and eye-piece provided with *dust protectors;* fixed stadia hairs.

OBJECT GLASS — Diameter, 1⅛ inches, used to its full value.

EYE-PIECE — Improved achromatic with abundance of light, giving a large, flat field.

HORIZONTAL AXIS — Length, 4½ inches; hardest bell metal, cast hollow to reduce weight, with large bearings; center point on top to permit accurate centering from above; extensions for auxiliary side telescopes.

LEVEL TO TELESCOPE — Length, 5 inches; graduated on the glass, indicating a variation of 30 seconds of arc to $\frac{1}{10}$ inch motion of the bubble.

Vertical Arc — Diameter, 5 inches; graduated on *solid silver*, reading 0 to 90 each way, with vernier reading to single minutes.

Standards — Phosphor bronze; rigid, and ribbed to reduce weight.

Horizontal Circle — Diameter, 5¼ inches to edge of graduation; graduated on *solid silver* to half-degrees, with exceptionally legible lines of uniform thickness; marked with two rows of figures, one reading from 0 to 180 and the other from 0 to 360; figures inclined in the direction they are to be read.

Verniers — Two, double and exactly opposite, reading to single minutes; placed at an angle of 30° to line of sight; graduated on *solid silver;* covered with polished plate glass and provided with ground glass shades.

Compass — Graduated to half-degrees, figured from 0 to 90 on each side of North and South; graduation and inside face of compass *silvered;* magnetic needle, 3⅝ inches, hardened and tempered steel, jewel center; variation ring with index point.

Plate Levels — Length, 2¼ inches; ground extra sensitive, indicating a variation of 40 seconds of arc to $\frac{1}{10}$ inch motion of the bubble.

Tangent Screws — Phosphor bronze; improved form, with opposing spiral spring; well protected but accessible to either hand; telescope tangent screw fitted with gradienter attachment.

Center — Compound, the inner one is made of bell metal; the intermediate, of gun metal; the outer, of phosphor bronze; extra long, perfectly tapered and fitted.

Parallel Plates — Of extra large diameter, the upper plate consisting of four well-braced arms.

FOUR LEVELING SCREWS — Phosphor bronze, of one solid piece, with accurately cut threads; provided with dust caps and ball and socket cups.

SHIFTING CENTER — Range of shift, § inch.

Finish — Bronzed and lacquered.

Weight — Instrument, 10 pounds; tripod, about 9 pounds.

The Instrument is packed whole and stands erect in a nicely finished mahogany box, which is provided with lock, hooks, strong leather strap and contains sun-shade, plumb bob, screw-driver, magnifying glass and adjusting pins.

No. 6060. Mountain and Mining Transit, with extension tripod No. 6207, box, etc. . . . . Each, $250 00

The above Instrument made to order with *inverting eye-piece*, without additional charge; or furnished, at an additional cost of $25 00, with plates and standards made of hard aluminum castings, thus reducing the weight about three pounds.

For Accessories, see page 479.

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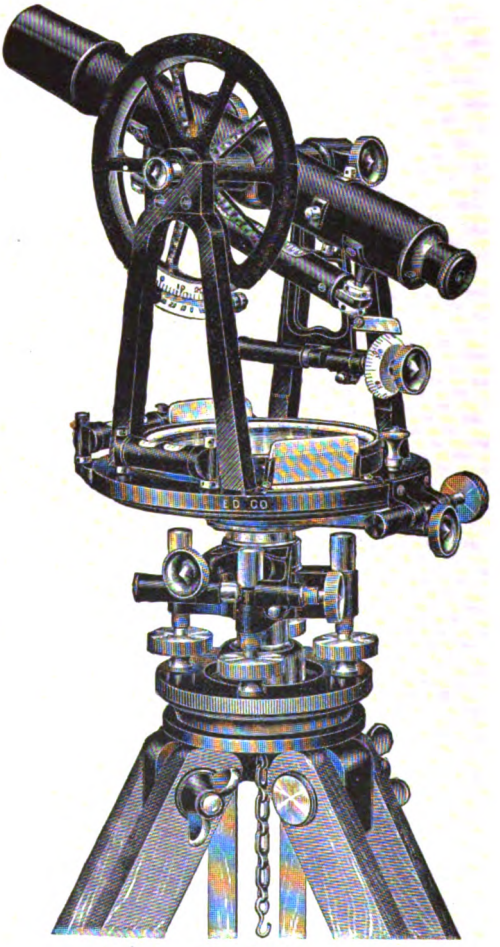
MOUNTAIN AND MINING TRANSIT

WITH VERTICAL CIRCLE



No. 6061.

No. 6061. Mountain and Mining Transit, with *Vertical Circle* 5 in. diam., with cloth-finished aluminum guard (specifications for No. 6060 also apply to this number); gradienter screw, fixed stadia hairs, ground glass vernier shades, and all graduations on *solid silver;* extension tripod No. 6207, box, etc., ... Each, $258 00

No. 6062½. Mountain and Mining Transit, like No. 6061, but with 4¾ inch *horizontal circle* and 4¾ inch *vertical circle* with cloth-finished aluminum guard: extension tripod No. 6207, box, etc., ... Each, $245 00

For Accessories, see page 479.

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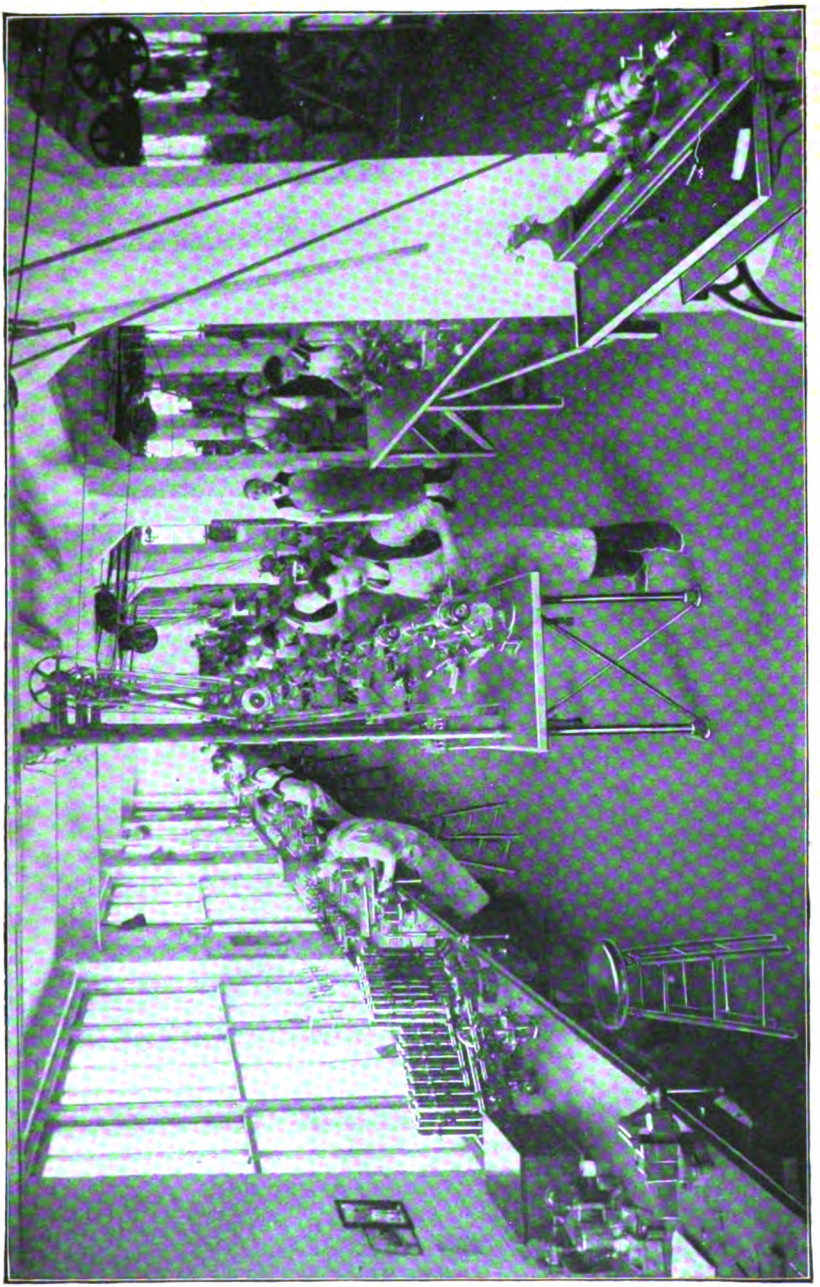

SECTION OF TELESCOPE DEPARTMENT — FACTORY

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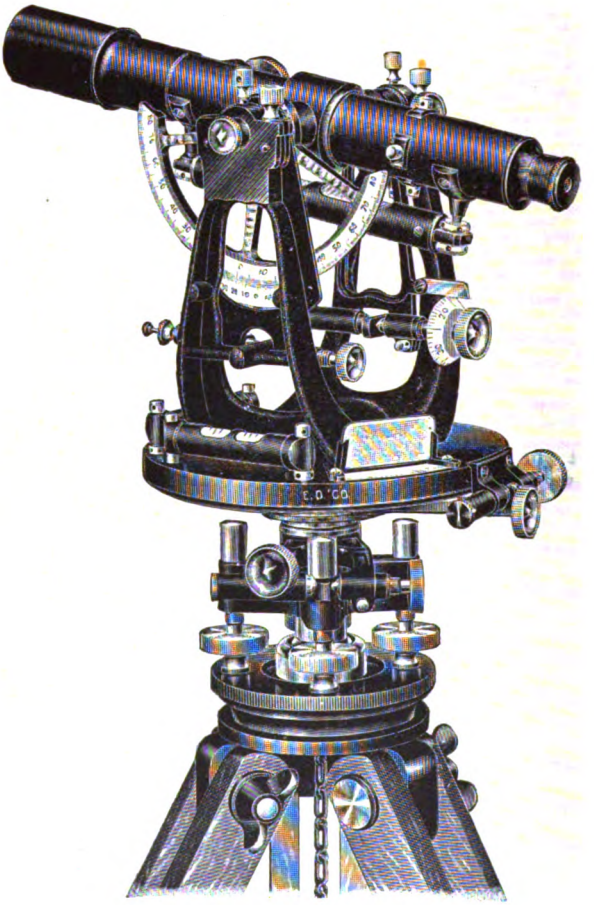
MOUNTAIN AND MINING TRANSIT THEODOLITE

WITH U-SHAPED STANDARDS AND VERTICAL ARC



No. 6063.

Mountain and Mining Transit Theodolite, as shown above, is of the same type as our No. 6058, but of reduced size, making it especially serviceable for mining purposes. It possesses all the valuable features of our larger instruments, such as highest optical qualities of the telescope, greatest accuracy of graduations and sensitive spirit levels, with the additional advantage of reduced size and weight.

For complete specifications, see next page.

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MOUNTAIN AND MINING THEODOLITE *Continued*

SPECIFICATIONS

Telescope — Length, 9½ inches; magnifying power, 20 diameters; achromatic terrestrial, powerful and of best definition; balanced, and reversible through standards and over bearings; line of collimation true for all distances; object slide and eye-piece provided with *dust protectors;* fixed stadia hairs.

OBJECT GLASS — Diameter, 1⅛ inches, used to its full value.

EYE-PIECE — Improved achromatic with abundance of light, giving a large, flat field.

HORIZONTAL AXIS — Length, 4½ inches; hardest bell metal, cast hollow to reduce weight; center point on top to permit accurate centering from above; extensions for auxiliary side telescopes.

LEVEL TO TELESCOPE — Length, 5 inches; graduated on the glass; highly sensitive, indicating a variation of 30 seconds of arc to $\frac{1}{10}$ inch motion of the bubble.

Vertical Arc — Diameter, 5 inches; graduated on *solid silver*, with vernier reading to single minutes.

Standards — U-shaped; cast of the highest quality phosphor bronze, in *one piece*; of compact, graceful design embodying the greatest lateral strength and rigidity.

BEARINGS — Cylindrical, insuring a true motion of the telescope in the vertical plane and eliminating any deflection in the line of sight caused by the rolling in the bearings.

Horizontal Circle — Diameter, 5½ inches to edge of graduation; graduated on *solid silver*, with exceptionally legible lines of uniform thickness; marked with two rows of figures, one reading from 0 to 180 and the other from 0 to 360; figures inclined in the direction they are to be read.

Verniers — Two, double and exactly opposite, reading to single minutes; placed at an angle of 30° to line of sight; graduated on *solid silver;* covered with polished plate glass and provided with ground glass shades.

Plate Levels — Length, 2½ inches; ground extra sensitive, indicating a variation of 40 seconds of arc to $\frac{1}{10}$ inch motion of the bubble.

Tangent Screws — Phosphor bronze; improved form, with opposing spiral spring; well protected but accessible to either hand; telescope tangent screw fitted with gradienter attachment.

Center — Compound, the inner one is made of bell metal; the intermediate, of gun metal; the outer, of phosphor bronze; extra long, perfectly tapered and fitted.

Parallel Plates — Of extra large diameter, the upper plate consisting of four well-braced arms.

FOUR LEVELING SCREWS — Phosphor bronze, of one solid piece, with accurately cut threads; provided with dust caps and ball and socket cups.

SHIFTING CENTER — Range of shift, ⅝ inch.

Finish — Standards, cloth-finished; all other parts bronzed and lacquered.

Weight — Instrument, 11 pounds; tripod, about 9 pounds.

The Instrument is packed whole and stands erect in a nicely finished mahogany box, which is provided with lock, hooks, strong leather strap and contains sun-shade, plumb bob, screw-driver, magnifying glass and adjusting pins.

No. 6063. Mountain and Mining Transit Theodolite, with *U-shaped standards*, extension tripod No. 6207, box, etc., Each, $270 00

For Accessories, see page 479.

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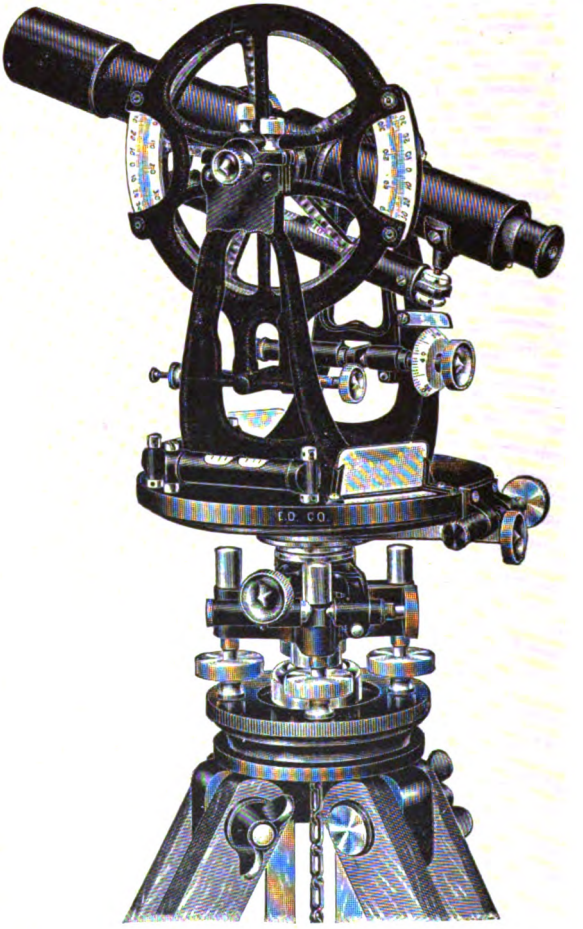
MOUNTAIN AND MINING TRANSIT THEODOLITE

WITH U-SHAPED STANDARDS AND VERTICAL CIRCLE



No. 6063½.

No. 6063½. Mountain and Mining Transit Theodolite, *without* Compass, but with *U-shaped Standards* and *Vertical Circle* 5 in. diam., protected by cloth-finished aluminum guard and graduated on *solid silver*, with two double exactly opposite adjustable verniers, reading to single minutes (specifications for No. 6063 also apply to this number); gradienter screw, fixed stadia hairs, ground glass vernier shades, and all graduations on *solid silver;* extension tripod No. 6207, box, etc., ... Each, **$275 00**

For Accessories, see page 479.

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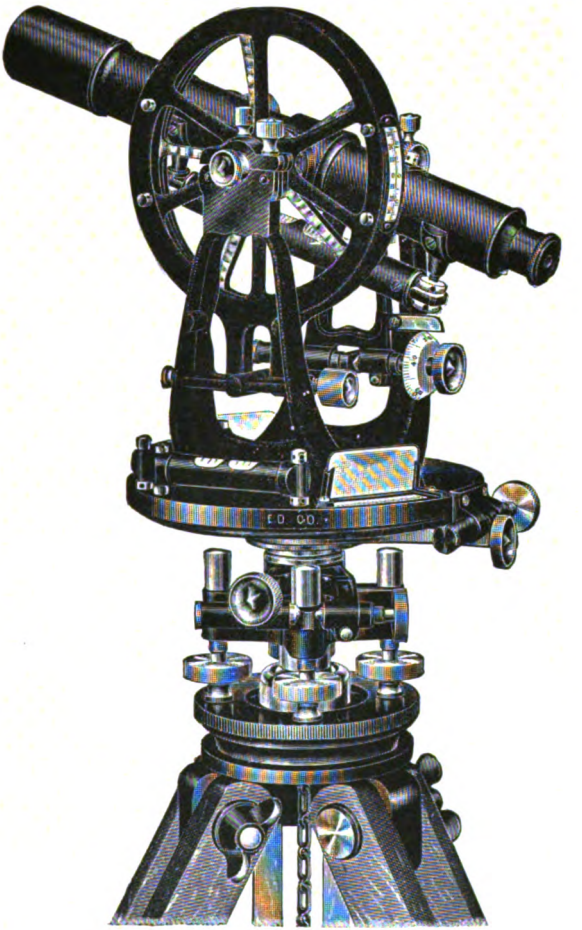
MOUNTAIN AND MINING TRANSIT THEODOLITE

WITH U-SHAPED STANDARDS AND VERTICAL CIRCLE WITH EDGE GRADUATIONS



No. 6064½.

No. 6064½. Mountain and Mining Transit Theodolite, as illustrated above, is of the same design and construction as No. 6063½, but with *edge graduations* on the vertical circle; extension tripod No. 6207, box, etc., Each, $295 00

Due to the limited space in underground and mine work, the reading of the *flat* vertical circle is often difficult. This difficulty is entirely eliminated by our edge graduations, as the reading is made *directly* from the eye-end of the telescope, without a change in the position of either the observer or the instrument.

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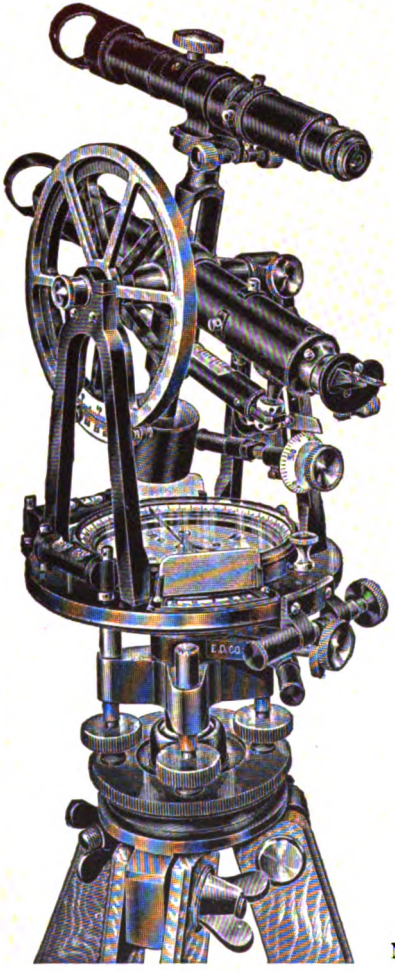
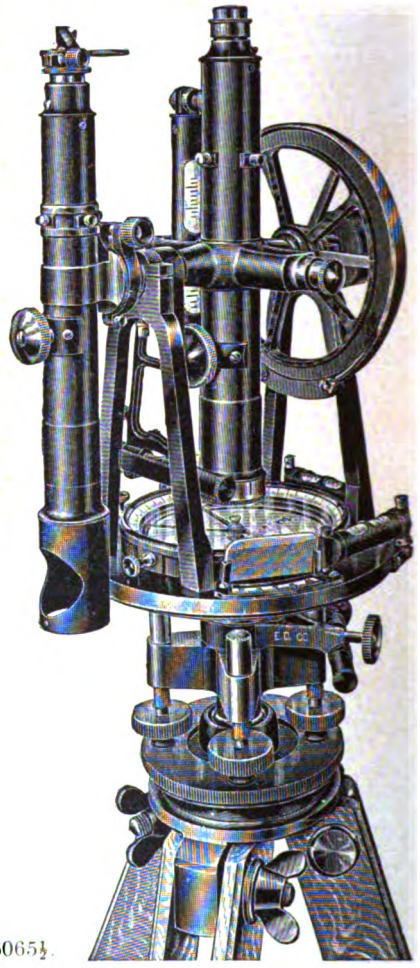
MOUNTAIN AND MINING TRANSIT

WITH INTERCHANGEABLE AUXILIARY TELESCOPE





No. 6065½

No. 6065 Mountain and Mining Transit, with *Level Attachment* and *Vertical Circle* 5 in. diam., with cloth-finished aluminum guard (specifications for No. 6060 also apply to this number); gradienter screw, fixed stadia hairs, ground glass vernier shades, and all graduations on *solid silver;* provided with Berger's Auxiliary Telescope, interchangeable to either top of main telescope or end of axis of same, with counterpoise and plain prism with colored glass; extension tripod No. 6207, box, etc., ... Each, **$300 00**

No. 6065½. Mountain and Mining Transit, like No. 6065, but with reflectors for illuminating the cross hairs of main and auxiliary telescopes and with pivoted prism with colored glasses; extension tripod No. 6207, box, etc., ... Each, **$320 00**

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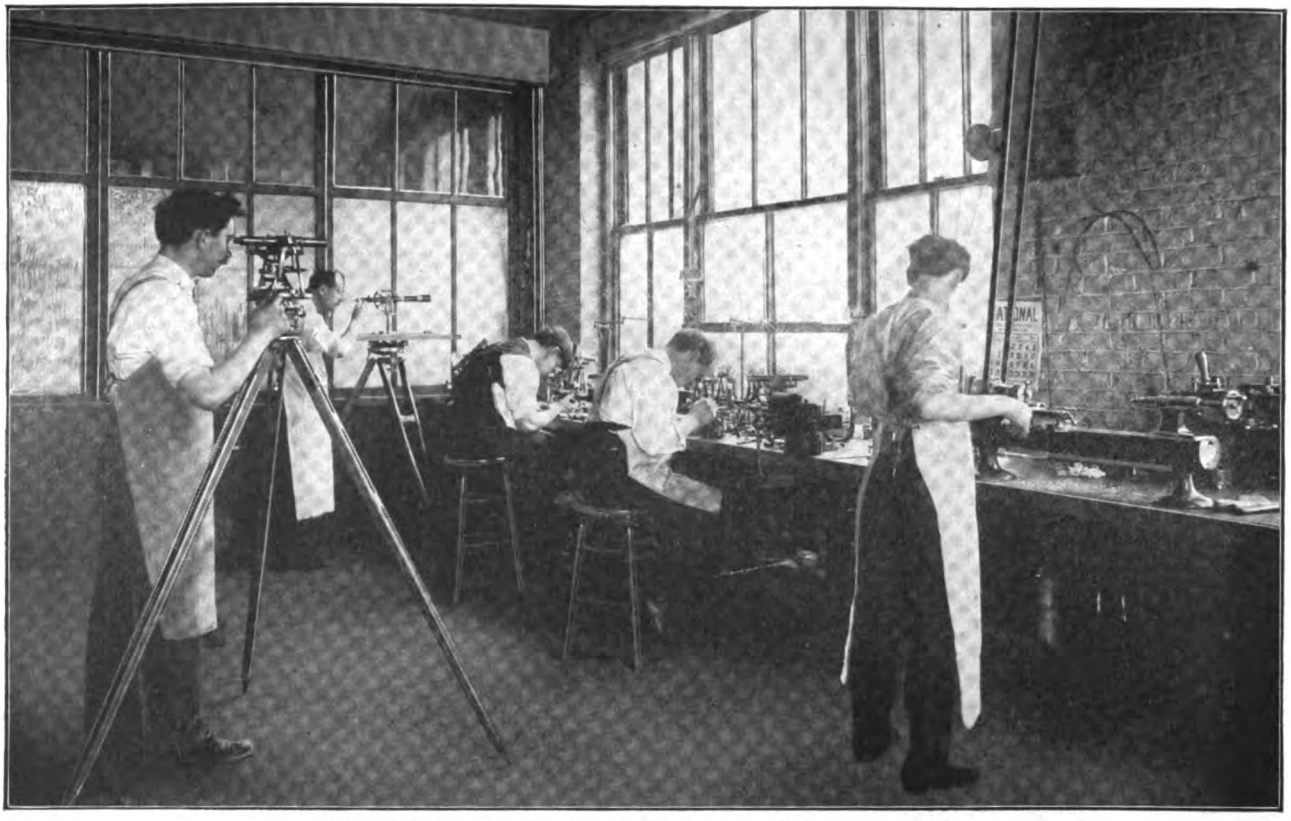

SURVEYING INSTRUMENTS — ADJUSTING DEPARTMENT — FACTORY

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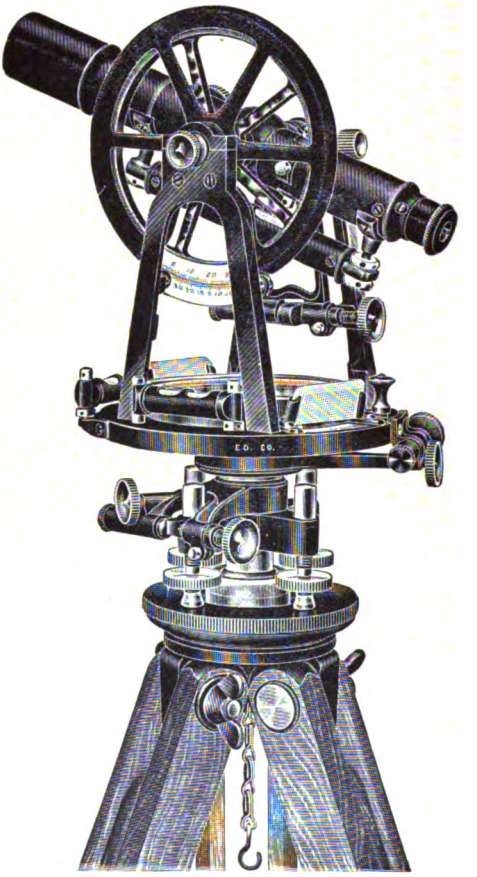
LIGHT MOUNTAIN AND MINING TRANSIT

Each Instrument of our make warranted to be first-class in every particular.



No. 6066.

Light Mountain and Mining Transit, as shown above, is of the same general construction as our larger high-grade Transits, differing from them only in size and weight.

The centers and telescope axis are made extra strong, so as to permit attaching either a side or top telescope, and thus bring the instrument more within the range of the larger mining transit.

For complete specifications, see next page.

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LIGHT MOUNTAIN AND MINING TRANSIT *Continued*

SPECIFICATIONS

Telescope — Length, 7½ inches; magnifying power, 16 diameters; achromatic terrestrial, of best definition; balanced, and reverses at both ends; line of collimation true for all distances; object slide and eyepiece provided with *dust protectors;* fixed stadia hairs.

OBJECT GLASS — Diameter, 1⅛ inches, used to its full value.

EYE-PIECE — Improved achromatic with abundance of light, giving a large, flat field.

HORIZONTAL AXIS — Length, 4 inches; hardest bell metal, cast hollow to reduce weight, with extra strong bearings to permit attaching either a side or top telescope; center point on top to permit accurate centering from above.

LEVEL TO TELESCOPE — Length, 4 inches; graduated on the glass, indicating a variation of 40 seconds of arc to $\frac{1}{10}$ inch motion of the bubble.

Vertical Circle — Diameter, 4½ inches; graduated on *solid silver* to half-degrees, with vernier reading to single minutes; protected by cloth-finished aluminum guard.

Standards — Phosphor bronze; rigid, and ribbed to reduce weight.

Horizontal Circle — Diameter, 4½ inches to edge of graduation; graduated on *solid silver* to half-degrees, with exceptionally legible lines of uniform thickness; marked with two rows of figures, one reading from 0 to 90 each way and the other from 0 to 360; figures inclined in the direction they are to be read.

Verniers — Two, double and exactly opposite, reading to single minutes; placed at an angle of 30° to line of sight; graduated on *solid silver;* covered with polished plate glass and provided with ground glass shades.

Compass — Graduated to half-degrees, figured from 0 to 90 on each side of North and South; graduation and inside face of compass *silvered;* magnetic needle, 3⅛ inches, hardened and tempered steel, jewel center; variation ring with index point.

Plate Levels — Length, 2 inches; ground extra sensitive, indicating a variation of 40 seconds of arc to $\frac{1}{10}$ inch motion of the bubble.

Tangent Screws — Phosphor bronze; improved form, with opposing spiral spring; well protected but accessible to either hand.

Center — Compound, the inner one is made of bell metal; the intermediate, of gun metal; the outer, of phosphor bronze; extra long, perfectly tapered and fitted.

Parallel Plates — Of extra large diameter, the upper plate consisting of four well-braced arms.

FOUR LEVELING SCREWS — Phosphor bronze, of one solid piece, with accurately cut threads; provided with dust caps and ball and socket cups.

SHIFTING CENTER — Range of shift, ½ inch.

Finish — Aluminum guard for vertical circle, cloth-finished; all other parts bronzed and lacquered.

Weight — Instrument, 5½ pounds; tripod, about 7 pounds.

The Instrument is packed whole and stands erect in a nicely finished mahogany box, which is provided with lock, hooks, strong leather strap and contains sun-shade, plumb bob, screw-driver, magnifying glass and adjusting pins.

No. 6066. Light Mountain and Mining Transit, with extension tripod No. 6208, box, etc. . . . . Each, $235 00

6068. Light Mountain and Mining Transit, like No. 6066, but with Berger's Auxiliary Telescope, interchangeable to either top or end of axis of main telescope, with counterpoise and plain prism with colored glass; extension tripod No. 6208, box, etc., ... Each, 285 00

The above Instruments made to order with *inverting eye-piece*, without additional charge; or furnished with *three leveling screws* (made to order only), at additional cost of $10 00.

For Accessories, see page 479.

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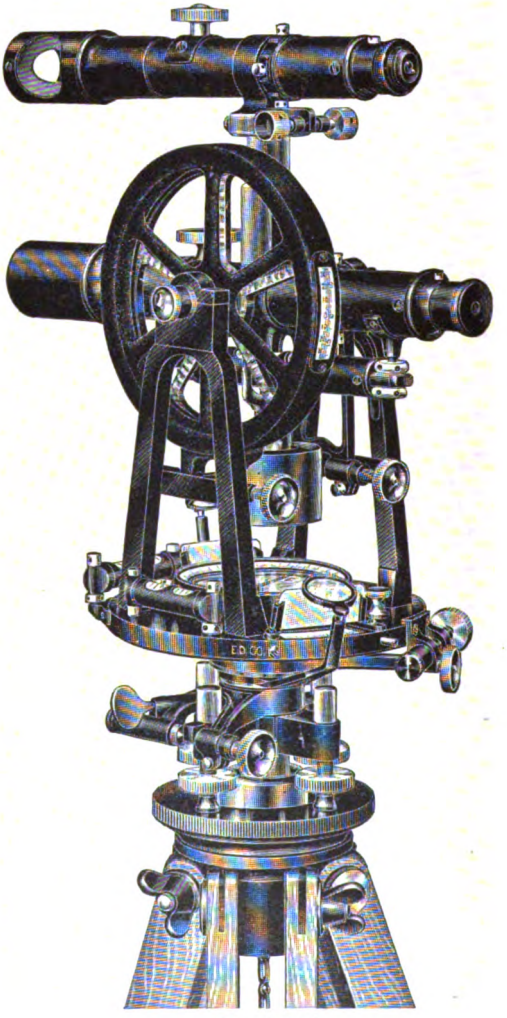
COMPLETE MOUNTAIN AND MINING TRANSIT

WITH INTERCHANGEABLE AUXILIARY TELESCOPE AND VERTICAL CIRCLE WITH EDGE GRADUATIONS



No. 6069.

Complete Mountain and Mining Transit, as shown above, represents a Mountain and Mining Transit of the highest type. It embodies all of the individual features found in other high-grade transits, and on account of this advantage and its excellent workmanship and finish it recommends itself.

For complete specifications, see next page.

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COMPLETE MOUNTAIN AND MINING TRANSIT

Continued

SPECIFICATIONS

Telescope — Length, 9 inches; magnifying power, 18 diameters; achromatic terrestrial, powerful and of best definition; balanced, and reverses at both ends; line of collimation true for all distances; object slide and eye-piece provided with *dust protectors;* lenses arranged so as to permit focusing of objects very close to the instrument without the aid of special attachments; disappearing stadia hairs and special wires for underground work.

OBJECT GLASS — Diameter, 1¼ inches, used to its full value.

EYE-PIECE — Improved achromatic with abundance of light, giving a large, flat field; provided with a colored glass shutter for direct solar observations and diagonal prism for sighting steep altitudes.

AUXILIARY TELESCOPE (Berger's Patent) — Attachable to either top of main telescope or end of axis of same, with counterpoise and plain prism with colored glass. A double target with a small spirit level for the quick adjustment of the Auxiliary Telescope is furnished with each instrument.

HORIZONTAL AXIS — Length, 4 inches; hardest bell metal, cast hollow to reduce weight, with extra strong bearings to permit attaching either a side or top telescope; center point on top to permit accurate centering from above.

LEVEL TO TELESCOPE — Length, 4 inches; graduated on the glass, indicating a variation of 20 seconds of arc to $\frac{1}{16}$ inch motion of the bubble.

Vertical Circle — Diameter, 4½ inches; *edge graduations* on *solid silver*, reading 0 to 90 each way, with two double and exactly opposite adjustable verniers reading to single minutes; graduations protected from dust and corrosion by a guard of improved design.

Standards — Phosphor bronze; rigid, and ribbed to reduce weight.

Horizontal Circle — Diameter, 4½ inches to edge of graduation; graduated on *solid silver* to half-degrees, with exceptionally legible lines of uniform thickness; marked with two rows of figures, one reading from 0 to 90 each way and the other from 0 to 360; figures inclined in the direction they are to be read.

Verniers — Two, double and exactly opposite, reading to single minutes; placed at an angle of 30° to line of sight; graduated on *solid silver;* covered with polished plate glass and provided with ground glass shades; graduation read by two detachable magnifiers.

Compass — Graduated to degrees, figured from 0 to 90 on each side of North and South; graduation and inside face of compass *silvered;* magnetic needle, 2½ inches, quick acting, hardened and tempered steel, jewel center; variation ring of improved and novel design, so arranged that the letters indicating the cardinal points will shift with the compass ring.

Plate Levels — Length, 1½ inches; indicating a variation of 40 seconds of arc to $\frac{1}{16}$ inch motion of the bubble.

Tangent Screws — Phosphor bronze; improved form, with opposing spiral spring; well protected but accessible to either hand; telescope tangent screw fitted with gradienter attachment.

Center — Compound, the inner one is made of bell metal; the intermediate, of gun metal; the outer, of phosphor bronze; extra long, perfectly tapered and fitted.

Parallel Plates — Of extra large diameter, the upper plate consisting of four well-braced arms.

FOUR LEVELING SCREWS — Phosphor bronze, of one solid piece, with accurately cut threads; provided with dust caps and ball and socket cups.

SHIFTING CENTER — Range of shift, ¼ inch.

Finish — Aluminum guard for vertical circle, cloth-finished; all other parts bronzed and lacquered.

Weight — Instrument, 8 pounds; tripod, about 7 pounds.

The Instrument is packed whole and stands erect in a nicely finished mahogany box, which is provided with lock, hooks, strong leather strap and contains sun-shade, plumb bob, screw-driver, magnifying glass and adjusting pins.

No. 6069.	Complete Mountain and Mining Transit, with Berger's Auxiliary Telescope, extension tripod No. 6208, box, etc., ... Each,	$350 00
6069R.	Complete Mountain and Mining Transit, like No. 6069, but with *reversion level* with cover; extension tripod No. 6208, box, etc., ... Each,	365 00
6069½.	Complete Mountain and Mining Transit, like No. 6069, but with *horizontal circle* 4½ inch and *vertical circle* 4½ inch, and without detachable magnifiers; extension tripod, No. 6207, box, etc., ... Each,	340 00
6071.	Complete Mountain and Mining Transit, like No. 6069, but with *U-shaped standards* and *Theodolite axis;* extension tripod No. 6208, box, etc., ... Each,	370 00
6072.	Complete Mountain and Mining Transit, like No. 6069½, but with *U-shaped standards* and *Theodolite axis;* extension tripod No. 6207, box, etc., ... Each,	360 00

For Accessories, see page 479.

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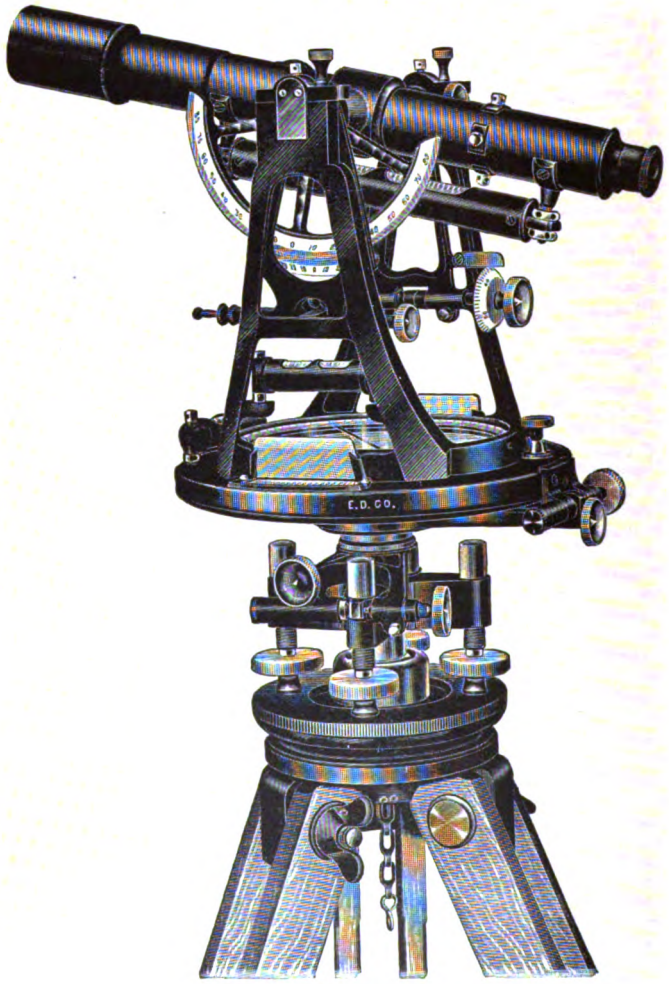
TRANSIT THEODOLITE

Each Instrument of our make warranted to be first-class in every particular.



No. 6075.

Transit Theodolite, as shown above, has been designed for the highest class of engineering work, for use where instruments of the usual construction fail to give satisfaction, or do not permit of rapid work combined with the highest degree of accuracy.

For complete specifications, see next page.

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TRANSIT THEODOLITE *Continued*

SPECIFICATIONS

Telescope — Length, 11½ inches; magnifying power, 26 diameters; achromatic terrestrial, powerful and of best definition; balanced, and reversible through standards and over bearings; line of collimation true for all distances; object slide and eye-piece provided with *dust protectors;* fixed stadia hairs.

OBJECT GLASS — Diameter, 1¼ inches, used to its full value.

EYE-PIECE — Improved achromatic with abundance of light, giving a large, flat field.

HORIZONTAL AXIS — Length, 6 inches; hardest bell metal, cast hollow to reduce weight; center point on top to permit accurate centering from above.

LEVEL TO TELESCOPE — Length, 6 inches; graduated on the glass, indicating a variation of 20 seconds of arc to $\frac{1}{10}$ inch motion of the bubble.

Vertical Arc — Diameter, 5 inches; graduated on *solid silver* to half-degrees, with vernier reading to single minutes; vernier adjustable and provided with tangent screw.

Standards — Phosphor bronze; cast in *one piece*, circular in form, giving strength and reliability, and permitting the use of a *large compass;* uprights well ribbed, insuring great lateral strength; cylindrical telescope bearings, provided with dust caps and adjusting screws for regulating the friction of the telescope axis; the cylindrical bearings insure a perfect motion of the telescope in the vertical plane.

Horizontal Circle — Diameter, 6½ inches to edge of graduation; graduated on *solid silver* to 20 minutes, with exceptionally legible lines of uniform thickness; marked with two rows of figures, one reading from 0 to 180 and the other from 0 to 360; figures inclined in the direction they are to be read.

Verniers — Two, double and exactly opposite, reading to 30 seconds; placed parallel to line of sight or at right angles, as desired; graduated on *solid silver;* covered with polished plate glass and provided with ground glass shades.

Compass — Graduated to half-degrees, figured from 0 to 90 on each side of North and South; graduation and inside face of compass *silvered;* magnetic needle, 4½ inches, hardened and tempered steel, jewel center.

Plate Levels — Length, 2½ inches; extra sensitive, indicating a variation of 30 seconds of arc to $\frac{1}{10}$ inch motion of the bubble.

Tangent Screws — Phosphor bronze; improved form, with opposing spiral spring; well protected but accessible to either hand; telescope tangent screw reversible and provided with gradienter attachment.

Center — Compound, the inner one is made of bell metal; the intermediate, of gun metal; the outer, of phosphor bronze; extra long, perfectly tapered and fitted.

Parallel Plates — Of extra large diameter, the upper plate consisting of four well-braced arms.

FOUR LEVELING SCREWS — Phosphor bronze, of one solid piece, with accurately cut threads; provided with dust caps and ball and socket cups.

SHIFTING CENTER — Range of shift, ⅞ inch.

Finish — Standards, cloth-finished; all other parts bronzed and lacquered.

Weight — Instrument, 13½ pounds; tripod, 9 pounds.

The Instrument is packed whole and stands erect in a nicely finished mahogany box, which is provided with lock, hooks, strong leather strap and contains sun-shade, plumb bob, screw-driver, magnifying glass and adjusting pins.

No. 6075. Transit Theodolite, with split-leg tripod No. 6205, box, etc., ... Each, $300 00

6076. Transit Theodolite, like No. 6075, but with *three* leveling screws; special split-leg tripod, box, etc., . . Each, 310 00

The above Instruments made to order with *inverting eye-piece*, without additional charge.

For Accessories, see page 479.

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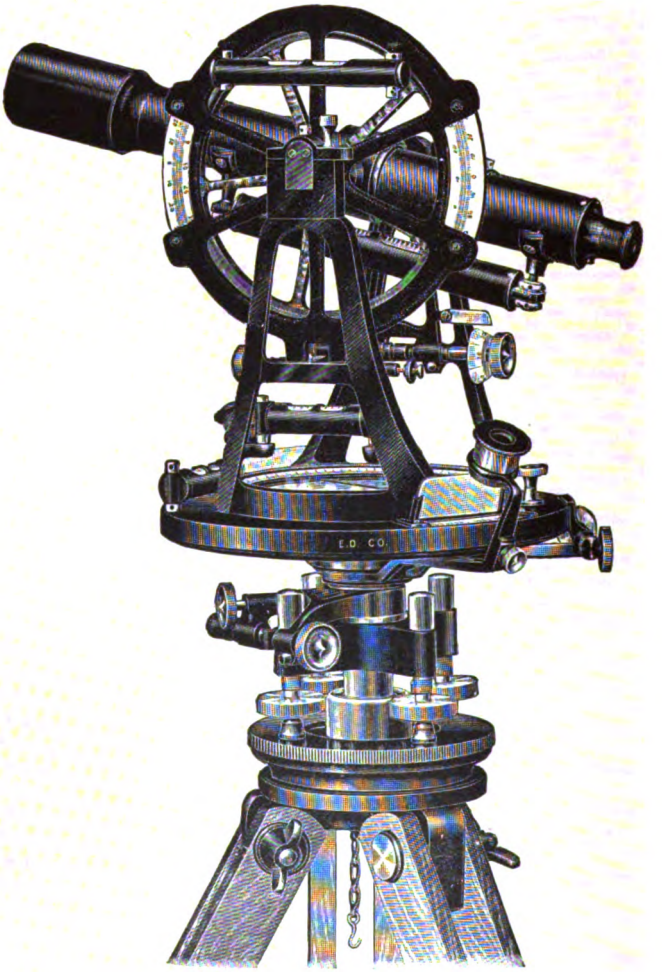
COMPLETE TRANSIT THEODOLITE

Each Instrument of our make warranted to be first-class in every particular.



No. 6078.

Complete Transit Theodolite, as illustrated, is designed for the most accurate triangulation as well as the highest grade of topographical work.

For complete specifications, see next page.

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COMPLETE TRANSIT THEODOLITE *Continued*

SPECIFICATIONS

Telescope — Length, 11½ inches; magnifying power, 28 diameters; achromatic terrestrial, powerful and of best definition; balanced, and reversible through standards and over bearings; line of collimation true for all distances; object slide and eye-piece provided with *dust protectors*; fixed stadia hairs.

OBJECT GLASS — Diameter, 1⅞ inches, used to its full value.

EYE PIECE — Improved achromatic with abundance of light, giving a large, flat field.

HORIZONTAL AXIS—Length, 5½ inches; hardest bell metal, cast hollow to reduce weight; center point on top to permit accurate centering from above.

LEVEL TO TELESCOPE — Length, 6 inches; graduated on the glass, indicating a variation of 20 seconds of arc to $\frac{1}{16}$ inch motion of the bubble.

Vertical Circle — Diameter, 6 inches; graduated on *solid silver* to 20 minutes, with two opposite verniers reading to 20 seconds; protected by a cloth-finished aluminum guard; provided with a sensitive level for the control of the zero point.

Standards — Phosphor bronze; cast in *one piece*, circular in form, giving strength and reliability, and permitting the use of a *large compass;* uprights well ribbed, insuring great lateral strength; cylindrical telescope bearings, provided with dust caps and adjusting screws for regulating the friction of telescope axis; the cylindrical bearings insure a perfect motion of the telescope in the vertical plane; standards cloth-finished.

Horizontal Circle — Diameter, 7 inches to edge of graduation; graduated on *solid silver* to 10 minutes, with exceptionally legible lines of uniform thickness; marked with one row of figures reading from 0 to 360.

Verniers — Two, double and exactly opposite, reading to 10 seconds; vernier openings extra large and placed at an angle of 30° to line of sight; graduated on *solid silver;* covered with polished plate glass and provided with ground glass shades; graduation read by two detachable magnifiers.

Compass — Graduated to half-degrees, figured from 0 to 90 on each side of North and South; graduation and inside face of compass *silvered;* magnetic needle, 4⅞ inches, hardened and tempered steel, jewel center.

Plate Levels — Length, 3 inches; extra sensitive, indicating a variation of 30 seconds of arc to $\frac{1}{16}$ inch motion of the bubble.

Tangent Screws — Phosphor bronze; improved form, with opposing spiral spring; well protected but accessible to either hand.

Center — Compound, the inner one is made of bell metal; the intermediate, of gun metal; the outer, of phosphor bronze; extra long, perfectly tapered and fitted.

Parallel Plates — Of extra large diameter, the upper plate consisting of four well-braced arms.

FOUR LEVELING SCREWS — Phosphor bronze, of one solid piece, with accurately cut threads; provided with dust caps and ball and socket cups.

SHIFTING CENTER — Range of shift, ⅛ inch.

Finish — Standards, cloth-finished; all other parts bronzed and lacquered.

Weight — Instrument, 14 pounds; tripod, 9 pounds.

The Instrument is packed whole and stands erect in a nicely finished mahogany box, which is provided with lock, hooks, strong leather strap and contains sun-shade, plumb bob, screw-driver, magnifying glass and adjusting pins.

No. 6078. Complete Transit Theodolite, with split-leg tripod No. 6205, box, etc., ... Each, $350 00

6079. Complete Transit Theodolite, like No. 6078, but with *three* leveling screws; special split-leg tripod, box, etc., Each, 365 00

The above Instruments made to order with *inverting eye-piece*, without additional charge.

For Accessories, see page 479.

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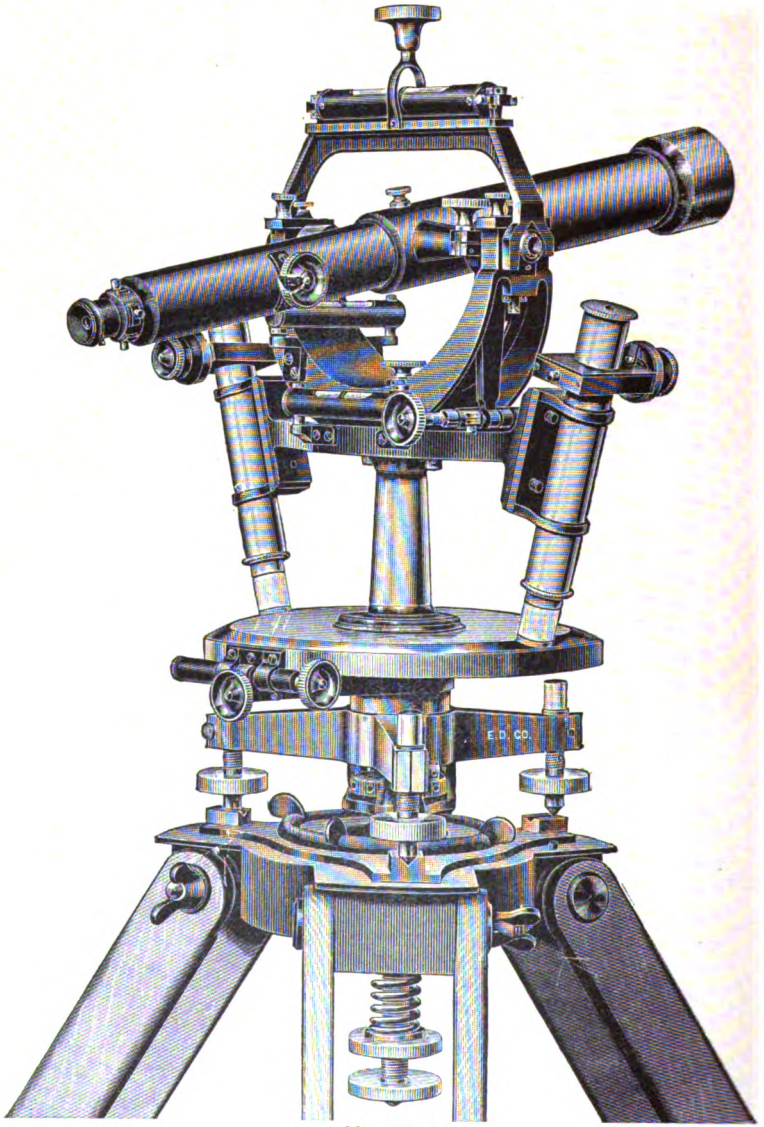
DIRECTION THEODOLITE



No. 6085.

Direction Theodolite, as illustrated above, is especially adapted for triangulation and is a non-repeater. The horizontal circle, however, is so arranged that different parts of the graduation can be brought under the reading microscopes so that the same angle can be read from various portions of the circle.

For complete specifications, see next page.

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DIRECTION THEODOLITE *Continued*

SPECIFICATIONS

Telescope — Length, 18 inches; magnifying power, about 35 diameters; achromatic terrestrial, powerful and of best definition; balanced, and reversible over bearings; line of collimation true for all distances; object slide and eye-piece provided with *dust protectors*.

OBJECT GLASS — Diameter, 1½ inches; used to its full value.

EYE-PIECE — Improved achromatic, with abundance of light.

HORIZONTAL AXIS — Length, 6 inches; hardest bell metal, cast hollow; telescope axis provided with an improved reversible clamp and prismatic field illumination; the one arm of the telescope axis is hollowed throughout its entire length and this hole connects with an opening in the telescope to permit passage of the rays from a lamp to the prism in the telescope; the lamp is attached to the standards by means of a bracket.

STRIDING LEVEL — Extra long and sensitive, indicating a variation of 5 seconds of arc to $\frac{1}{10}$ inch motion of the bubble; rests directly on the telescope bearings.

Standards — Of novel design; U-shaped, cast in one piece of phosphor bronze; the uprights are well ribbed, combining great lateral strength with lightness in weight; V-shaped bearings with sliding caps, insuring perfect motion of the telescope in the vertical plane.

Horizontal Circle — Diameter, 8 inches to edge of graduation; graduated on *solid silver* to 10 minutes, with exceptionally legible lines of uniform thickness; *each degree*, from 1 to 360, is numbered with a minute figure; all graduations covered, and visible only through two exactly opposite filar micrometer microscopes, by which they are read without the aid of verniers.

Plate Levels — Length, 4 inches; especially sensitive, indicating a variation of 20 seconds of arc to $\frac{1}{10}$ inch motion of the bubble.

Tangent Screws — Phosphor bronze; improved form, with opposing spiral spring; well protected but accessible to either hand.

Center — Special design, consisting of an inner center of hardest bell metal, extending from the head of the tripod to the bottom of the U-shaped standards; attached to the flange of this center is the plate with the graduations; the outer center or sleeve fits accurately over the inner one and extends from the top of the plate to the bottom of the U-shaped standards; this outer center carries the cover for the plate as well as the cross bar and the U-shaped standards; the shift of the instrument is accomplished after loosening the clamp screw at the lower end of the inner center, whereas the final bisecting is made with the clamp and tangent screw of the plate cover.

Parallel Plates — Of extra large diameter, the upper plate consisting of three well-braced arms.

THREE LEVELING SCREWS — Phosphor bronze, of one solid piece, with accurately cut threads; provided with dust caps.

SHIFTING CENTER — Range of shift, about 1½ inch.

Finish — U-shaped standards, cloth-finished; all other parts bronzed and lacquered.

Weight — Instrument, about 15 pounds; special tripod, about 11 pounds.

The Instrument is packed whole and stands erect in a nicely finished mahogany box, which is provided with lock, hooks, strong leather strap and contains sun-shade, extra heavy plumb bob, screw-driver and adjusting pins.

No. 6085. Direction Theodolite, 8 in. graduation, covered; with special tripod, box, etc.. . . . . Each, $450 00

For Accessories, see page 479.

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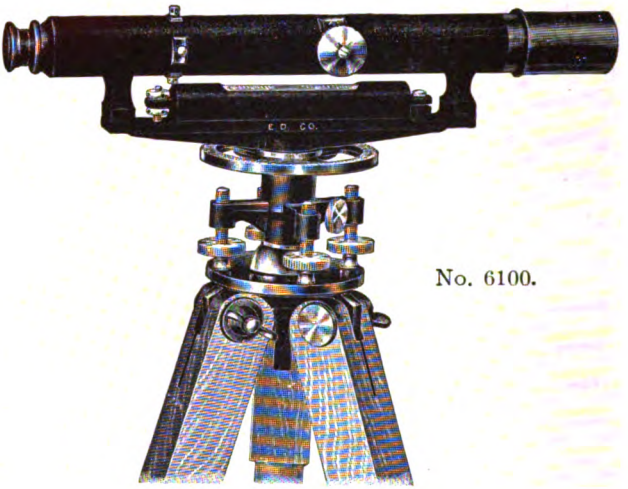
BUILDERS' DUMPY LEVEL



No. 6100.

Builders' Dumpy Level, as shown above, is a low-priced but reliable and well-made instrument, and will meet all the requirements of the Builder, Contractor or Millwright. It is simple in construction, does not get out of adjustment easily, and requires less careful handling than the "Y" Level.

SPECIFICATIONS

Telescope — Length, 11½ inches; magnifying power, 18 diameters; achromatic terrestrial, of good definition; focused by rack and pinion; eye-piece provided with a screw-like arrangement for precise focusing of cross hairs.

Cross Bar — Length, 8 inches; ribbed to increase stability and decrease weight.

LEVEL TO CROSS BAR — Length, 5 inches; graduated on the glass.

Horizontal Circle — Diameter, 3 inches; graduated to degrees, numbered 0 to 90 each way, with vernier reading to 5 minutes.

Parallel Plates — Substantial, with *four* leveling screws; provided with clamp to spindle.

Finish — Telescope, level vial casing and cross bar, cloth-finished; all other parts bronzed and lacquered.

Weight — Instrument, 4 pounds; tripod, 6 pounds.

The Instrument is packed whole and stands erect in a nicely finished box, which is provided with a lock and strong leather strap and contains a metal trivet (for setting Level where the use of tripod is difficult), adjusting pin, plumb bob and sun-shade.

No. 6100. Builders' Dumpy Level, with tripod No. 6202, box, etc., ... Each, $ 37 50

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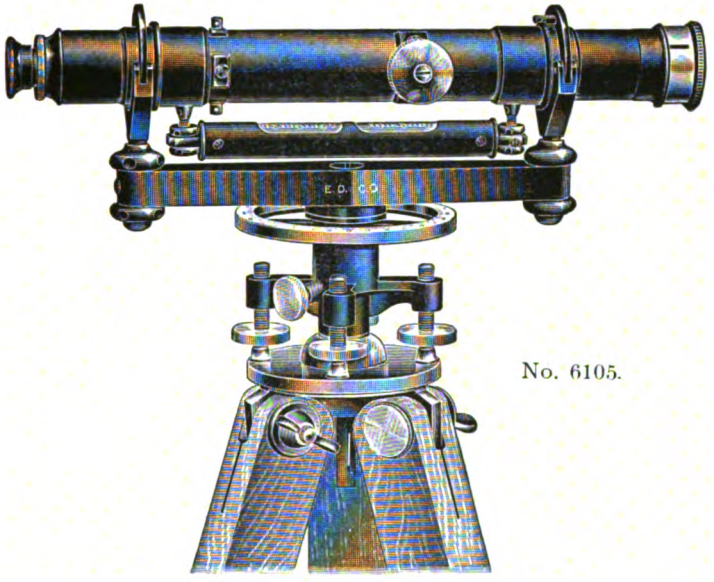
ARCHITECTS' LEVEL



No. 6105.

Architects' Level, as shown above, is of the same design and appearance as our No. 6005 Architects' Level, differing from it only in the construction and finish of some of the minor parts. The optical parts, telescope bearings, and center are the same. An efficient, serviceable Level at a moderate price.

SPECIFICATIONS

Telescope — Length, 11 inches; magnifying power, 18 diameters; achromatic terrestrial, of good definition; focused by rack and pinion; eye-piece provided with a screw-like arrangement for precise focusing of cross hairs.

LEVEL TO TELESCOPE — Length, 5 inches; graduated on the glass.

Cross Bar — Length, 8 inches; rigid construction.

WYES — Provided with pin and cord locking attachment.

Horizontal Circle — Diameter, 3 inches; graduated to degrees, numbered 0 to 90 each way, with vernier reading to 5 minutes.

Parallel Plates — Substantial, with *four* leveling screws; provided with clamp to spindle.

Finish — Cross bar, cloth-finished; all other parts bronzed and lacquered.

Weight — Instrument, 5 pounds; tripod, 6 pounds.

The Instrument is packed whole and stands erect in a nicely finished box, which is provided with a lock and strong leather strap, and contains a metal trivet (for setting Level where use of tripod is difficult), adjusting pins, plumb bob and sun-shade.

No. 6105. Architects' Level, with tripod No. 6202, box, etc., Each, $42 50

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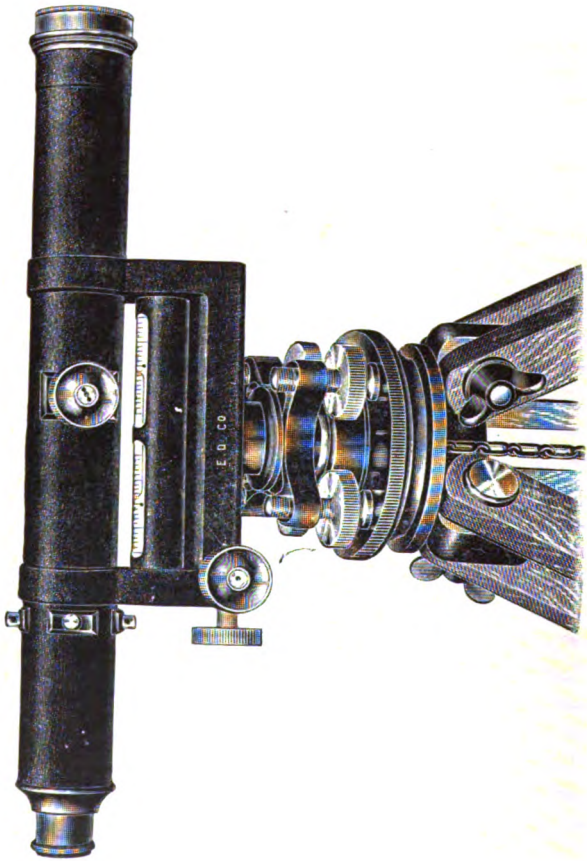
RAILROAD DUMPY LEVEL



No. 6125.

For complete specifications, see next page

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RAILROAD DUMPY LEVEL *Continued*

The Railroad Dumpy Level, as shown on preceding page, has been designed to meet the demand for a low-priced but serviceable Dumpy Level. The construction of the less essential parts is such as to permit a reduction in cost, while we have been able to maintain all the good qualities of a Dumpy Level necessary to give reliable results, as this instrument possesses a good telescope and a long, sensitive level vial.

SPECIFICATIONS

Telescope — Length, 15 inches; magnifying power, 25 diameters; achromatic terrestrial, powerful and of good definition; object slide and eye-piece provided with *dust protectors*.

OBJECT GLASS — Diameter, 1⅜ inches, used to its full value.

EYE-PIECE — Improved style, giving a large, flat field; provided with a screw-like arrangement for precise focusing of cross hairs.

Cross Bar — Length, 7½ inches; gun metal; designed to combine *lightness* with *strength;* provided with clamp and tangent screw; substantial telescope supports.

LEVEL TO CROSS BAR — Length, 6 inches; graduated on the glass, indicating a variation of 30 seconds of arc to $\frac{1}{10}$ inch motion of the bubble.

Center — Gun metal, cast with the cross bar in *one piece*, insuring great strength and accuracy.

Parallel Plates — Cast of bronze, of compact design.

FOUR LEVELING SCREWS — Phosphor bronze, of one solid piece, with accurately cut threads; provided with ball and socket cups.

Finish — Telescope, cross bar and level vial casing, cloth-finished; parallel plates, japanned; all other parts bronzed and lacquered.

Weight — Instrument, 7½ pounds; tripod, about 8 pounds.

The Instrument is packed whole and stands erect in a nicely finished mahogany box, which is provided with lock, hooks, strong leather strap and contains sun-shade and adjusting pin.

No. 6125. Railroad Dumpy Level, with split-leg tripod No. 6204, box, etc., ... Each, $65 00

6126. Railroad Dumpy Level, like No. 6125, but with telescope 12 in. long and *inverting eye-piece;* split-leg tripod No. 6204, box, etc., ... Each, 65 00

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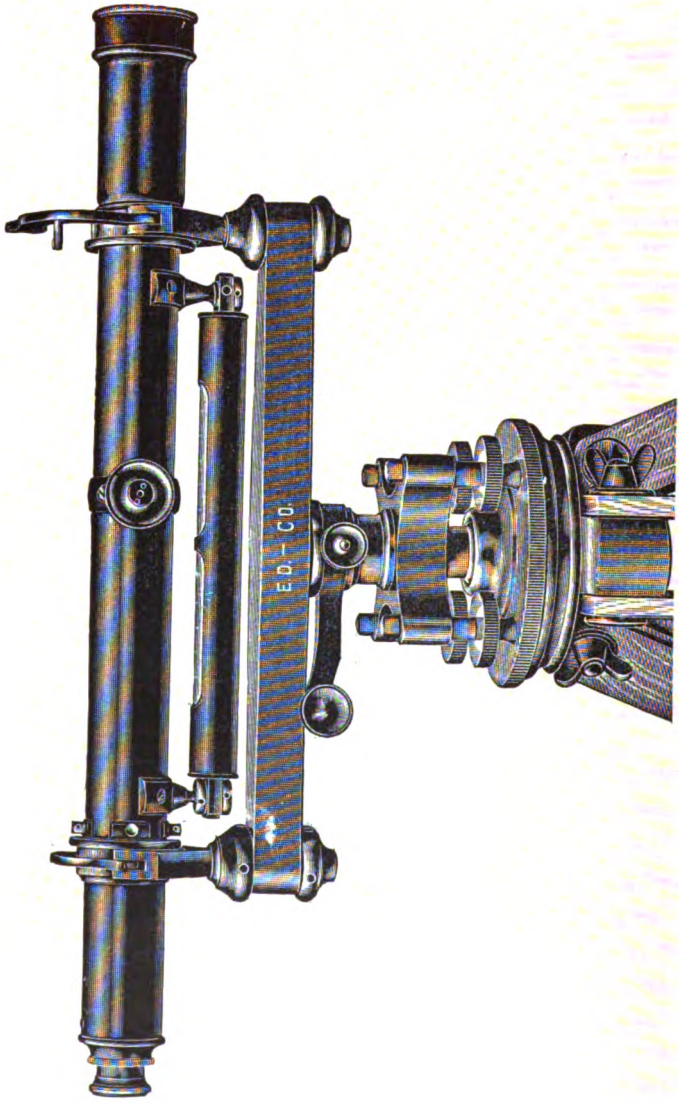
RAILROAD ENGINEERS' Y LEVEL



No. 6130.

Railroad Engineers' Y Level, as shown above, is designed on the same lines as our high-grade levels, and is an excellent instrument for railroad work and land surveying. In accuracy, durability, workmanship and finish, it will compare favorably with many high-grade makes.

For complete specifications, see next page.

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RAILROAD ENGINEERS' Y LEVEL *Continued*

SPECIFICATIONS

Telescope — Length, 18 inches; magnifying power, 30 diameters; achromatic terrestrial, of good definition; provided with a vertical stop, so as to bring the cross hairs in a true vertical and horizontal position; line of collimation true for all distances; object slide and eye-piece provided with *dust protectors;* collars of hardest bell metal, truly cylindrical and of equal diameter.

OBJECT GLASS — Diameter, $1\frac{3}{8}$ inches, used to its full value.

EYE-PIECE — Improved style, giving a large, flat field; provided with a screw-like arrangement for precise focusing of cross hairs.

LEVEL TO TELESCOPE — Length, 8 inches; graduated on the glass, indicating a variation of 30 seconds of arc to $\frac{1}{10}$ inch motion of the bubble.

Cross Bar — Length, 12 inches; gun metal; designed so as to give lightness combined with strength.

WYES — Provided with pin and cord locking attachment.

Center — Hardest bell metal; extends from the cross bar to the bottom of the lower parallel plate, thus increasing the strength, accuracy and stability of the instrument.

Tangent Screw — Phosphor bronze; improved form, with opposing spiral spring; well protected but accessible to either hand.

Parallel Plates — Of large diameter, the upper plate consisting of four well-braced arms; *four* leveling screws.

Finish — Telescope and level vial casing, cloth-finished; all other parts bronzed and lacquered.

Weight — Instrument, 10 pounds; tripod, about 8 pounds.

The Instrument is packed whole and stands erect in a nicely finished mahogany box, which is provided with a lock and strong leather strap and contains sun-shade, screw-driver, and adjusting pins.

No. 6130. Railroad Engineers' Y Level, with split-leg tripod No. 6205, box, etc., ... Each, $110 00

6132. Railroad Engineers' Y Level, like No. 6130, but with *15 inch* telescope; split-leg tripod No. 6205, box, etc., Each, 100 00

6133. Railroad Engineers' Y Level, like No. 6130, but with *20 inch* telescope; split-leg tripod No. 6205, box, etc., Each, 115 00

6134. Railroad Engineers' Y Level, like No. 6130, but with *22 inch* telescope; split-leg tripod No. 6205, box, etc., Each, 120 00

The above Levels made to order with *inverting eye-piece*, without additional charge.

For our highest grade Engineers' Y Levels, see Nos. 6030-6034.

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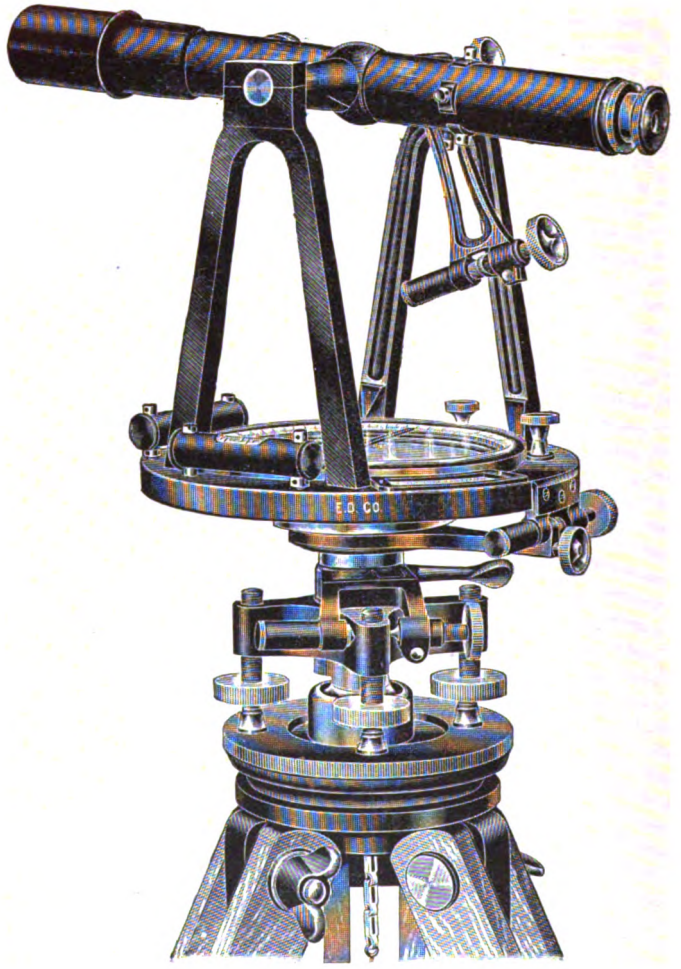
RAILROAD ENGINEERS' TRANSIT—PLAIN



No. 6135.

Railroad Engineers' Transit — Plain, as shown above, is an excellent instrument for all general work where extreme accuracy is not required. In durability, workmanship, accuracy and finish, it will compare favorably with many high-grade makes. The optical parts and accuracy of the graduations are the same as on our higher grade transits.

For complete specifications, see next page.

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RAILROAD ENGINEERS' TRANSIT—PLAIN *Continued*

SPECIFICATIONS

Telescope — Length, 11 inches; magnifying power, 22 diameters; achromatic terrestrial, powerful and of best definition; balanced, and reverses at both ends; line of collimation true for all distances; object slide and eye-piece provided with *dust protectors.*

OBJECT GLASS — Diameter, 1⅛ inches, used to its full value.

EYE-PIECE — Improved achromatic with abundance of light, giving a large, flat field.

HORIZONTAL AXIS — Length, 5¾ inches; hardest bell metal, cast hollow to reduce weight, with large bearings; center point on top to permit accurate centering from above.

Standards — Phosphor bronze; rigid, and ribbed to reduce weight.

Horizontal Circle — Diameter, 6¼ inches to edge of graduation; graduated on *solid silver* to half-degrees, with exceptionally legible lines of uniform thickness; marked with two rows of figures, one reading from 0 to 180 and the other from 0 to 360; figures inclined in the direction they are to be read.

Verniers — Two, double and exactly opposite, reading to single minutes; placed at an angle of 30° to line of sight.

Compass — Graduated to half-degrees, figured from 0 to 90 on each side of North and South; graduation and inside face of compass *silvered;* magnetic needle, 4½ inches, hardened and tempered steel, jewel center; variation plate with rack and pinion.

Plate Levels — Length, 2½ inches; sensitive, indicating a variation of 50 seconds of arc to $\frac{1}{10}$ inch motion of the bubble.

Tangent Screws — Phosphor bronze; improved form, with opposing spiral spring; well protected but accessible to either hand.

Center — Compound, the inner one is made of bell metal; the intermediate, of gun metal; the outer, of phosphor bronze; extra long, perfectly tapered and fitted.

Parallel Plates — Of large diameter, the upper plate consisting of four well-braced arms; *four* leveling screws.

SHIFTING CENTER — Range of shift, ⅞ inch.

Finish — Standards, cloth-finished; all other parts bronzed and lacquered.

Weight — Instrument, 13 pounds; tripod, 9 pounds.

The Instrument is packed whole and stands erect in a nicely finished mahogany box, which is provided with a lock and strong leather strap and contains plumb bob, sun-shade, magnifying glass and adjusting pins.

No. 6135. Railroad Engineers' Transit-Plain, with split-leg tripod
No. 6205, box, etc., ... Each, $160 00

For our highest grade Engineers' Transits, see Nos. 6035-6059½.

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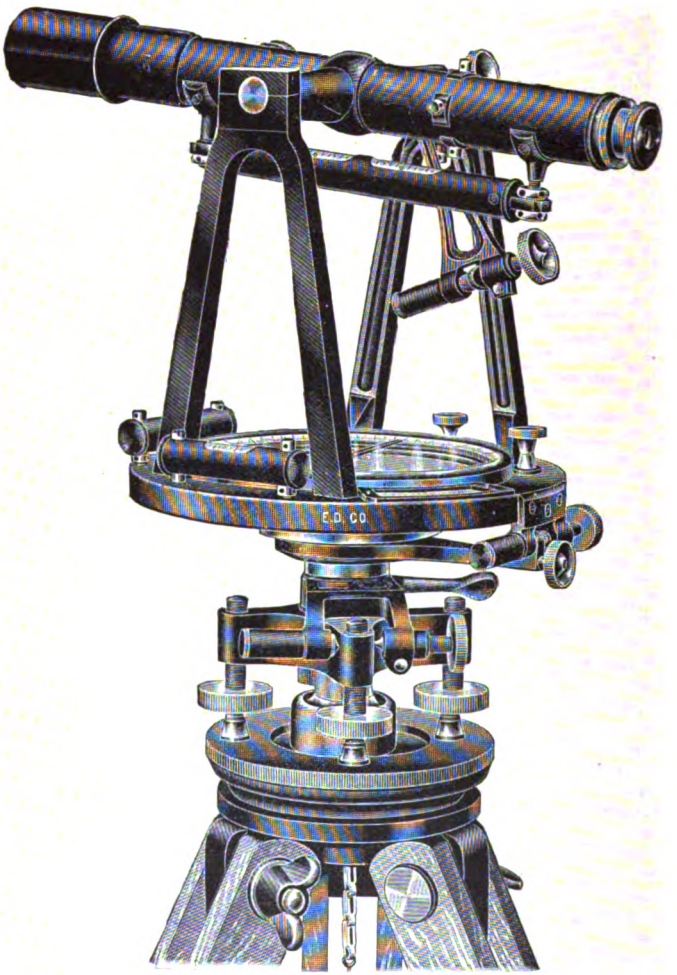
RAILROAD ENGINEERS' TRANSIT

WITH LEVEL ATTACHMENT



No. 6145.

No. 6145. Railroad Engineers' Transit, with *Level Attachment* (specifications for No. 6135 also apply to this number); clamp and tangent screw to telescope axis; level vial 6 inches long, indicating a variation of 30 seconds of arc to $\frac{1}{16}$ in. motion of the bubble; split-leg tripod No. 6205, box, etc., ... Each, **$170 00**

For our highest grade Engineers' Transits, see Nos. 6035-6059½.

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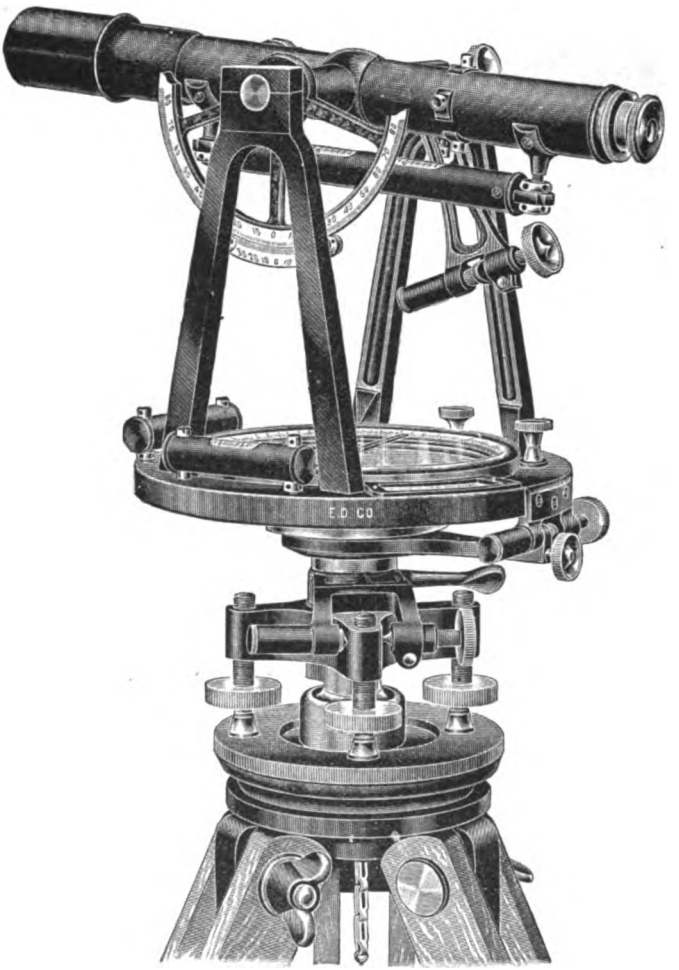
RAILROAD ENGINEERS' TRANSIT

WITH LEVEL ATTACHMENT AND VERTICAL ARC



No. 6150.

No. 6150. Railroad Engineers' Transit, with *Level Attachment* and *Vertical Arc* 5 in. diam., graduated on *solid silver*, with vernier reading to single minutes (specifications for No. 6135 also apply to this number); clamp and tangent screw to telescope axis; level vial 6 inches long, indicating a variation of 30 seconds of arc to $\frac{1}{10}$ in. motion of the bubble; split-leg tripod No. 6205, box, etc., ... Each, $185 00

For our highest grade Engineers' Transits, see Nos. 6035-6059½.

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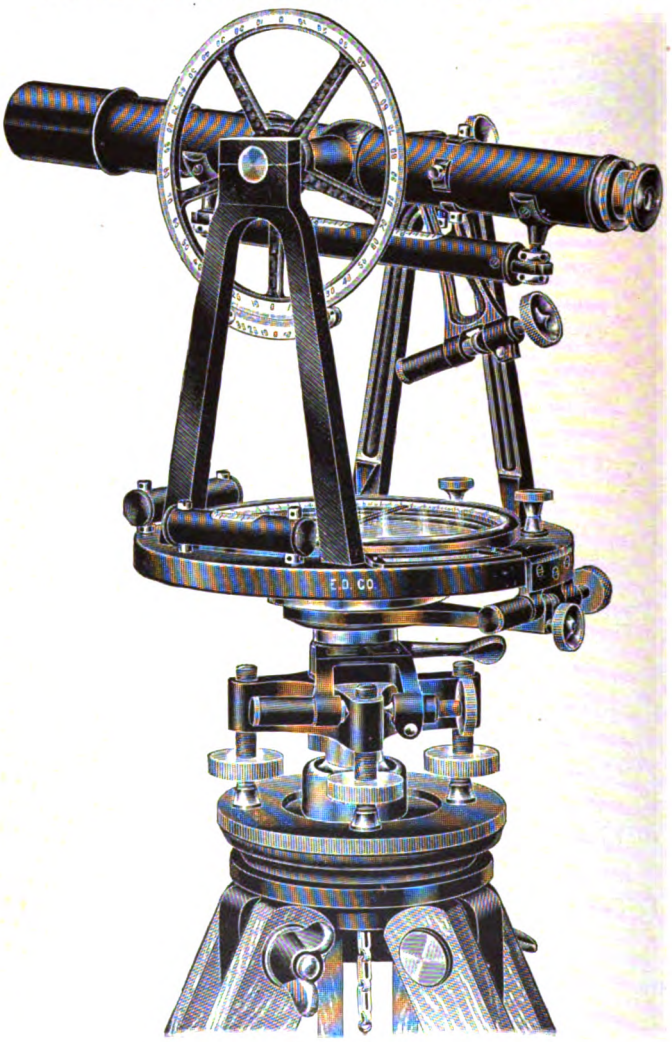
RAILROAD ENGINEERS' TRANSIT

WITH LEVEL ATTACHMENT AND VERTICAL CIRCLE



No. 6155.

No. 6155. Railroad Engineers' Transit, with *Level Attachment* and *Vertical Circle* 5 in. diam., graduated on *solid silver*, with vernier reading to single minutes (specifications for No. 6135 also apply to this number); clamp and tangent screw to telescope axis; level vial 6 inches long, indicating a variation of 30 seconds of arc to $\frac{1}{10}$ in. motion of the bubble; split-leg tripod No. 6205, box, etc., ... Each, $190 00

For our highest grade Engineers' Transits, see Nos. 6035-6059½.

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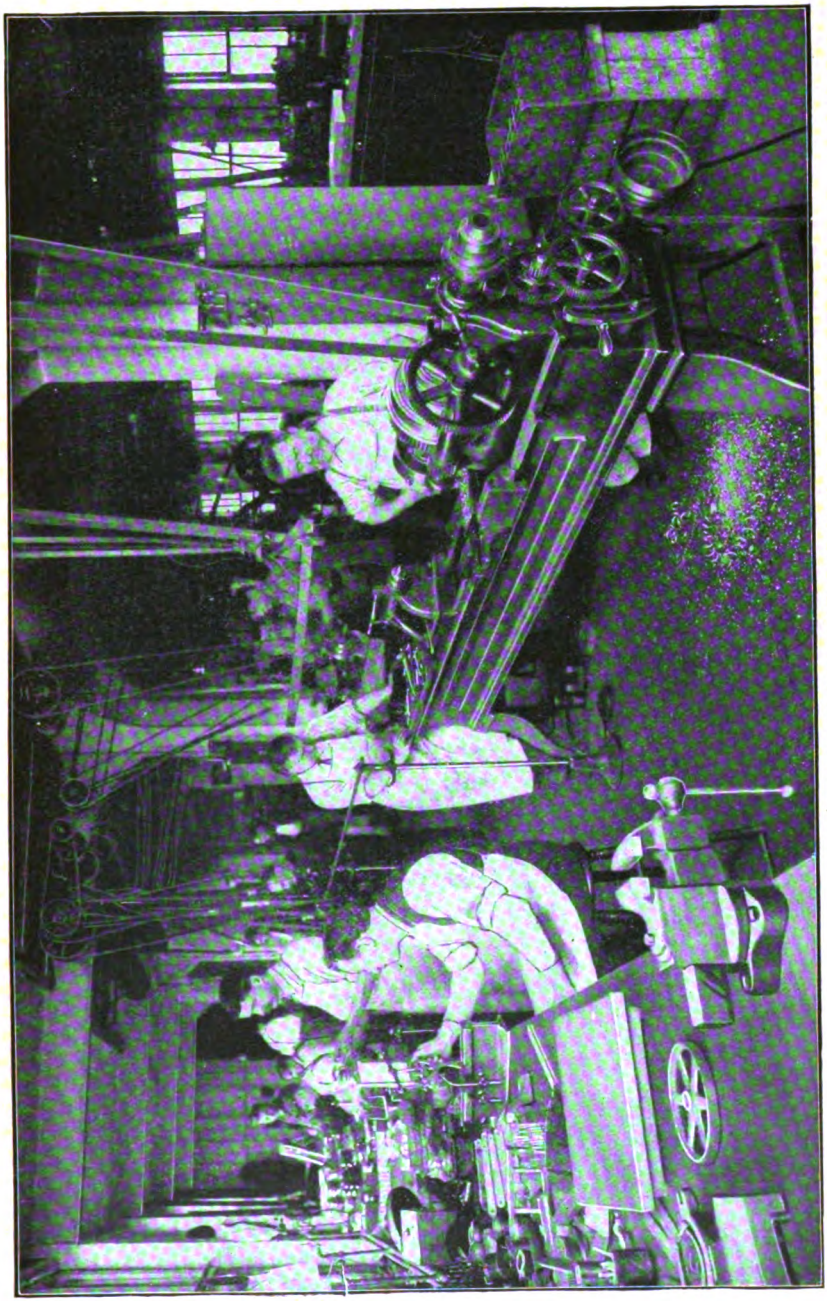

SECTION OF TOOL SHOP — FACTORY

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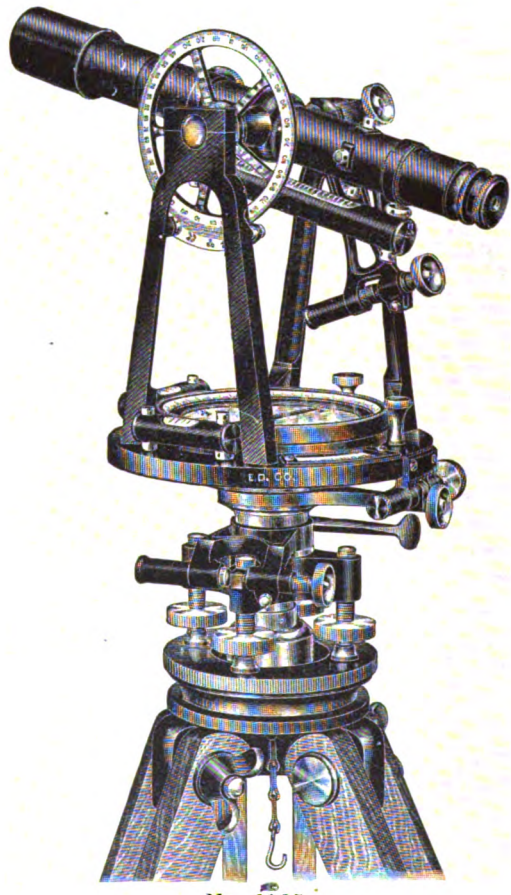
RECONNOISSANCE TRANSIT



No. 6165.

Reconnoissance Transit, as illustrated above, is a light and durable instrument especially adapted for general engineering work which does not require the highest degree of accuracy. It is well made and reliable, and will be found very serviceable for all preliminary work.

For complete specifications, see next page.

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RECONNOISSANCE TRANSIT *Continued*

SPECIFICATIONS

Telescope — Length, 9 inches; magnifying power, 21 diameters; achromatic terrestrial, of good definition; balanced, and reverses at both ends; line of collimation true for all distances; object slide and eye-piece provided with *dust protectors*; fixed stadia hairs.

OBJECT GLASS — Diameter, 1 inch, used to its full value.

EYE-PIECE — Improved, giving a flat field; provided with a screw-like arrangement for precise focusing of cross hairs.

HORIZONTAL AXIS — Length, 4 inches; hardest bell metal, cast hollow to reduce weight.

LEVEL TO TELESCOPE — Length, 4½ inches; graduated on the glass, indicating a variation of 30 seconds of arc to $\frac{1}{10}$ inch motion of the bubble.

Vertical Circle — Diameter, 3½ inches; *silvered;* graduated to degrees, reading 0 to 90 each way, with vernier reading to 2 minutes.

Standards — Phosphor bronze; rigid, and ribbed to reduce weight.

Horizontal Circle — Diameter, 5 inches to edge of graduation; graduated on *solid silver* to half-degrees, with one double vernier reading to single minutes, placed at an angle of 30° to line of sight; marked from 0 to 180 each way.

Compass — Graduated to half-degrees, figured from 0 to 90 on each side of North and South; graduation and inside face of compass *silvered;* magnetic needle, 3½ inches, hardened and tempered steel; variation plate with vernier and rack and pinion.

Plate Levels — Length, 2 inches; indicating a variation of 1 minute of arc to $\frac{1}{10}$ inch motion of the bubble.

Tangent Screws — Phosphor bronze; improved form, with opposing spiral spring; well protected but accessible to either hand.

Center — Of substantial design, in harmony with the general construction and quality of the instrument.

Parallel Plates — Of large diameter, the upper plate consisting of four well-braced arms; *four* leveling screws.

SHIFTING CENTER — Range of shift, ½ inch.

Finish — Standards, cloth-finished; all other parts bronzed and lacquered.

Weight — Instrument, 10 pounds; tripod, 9 pounds.

The Instrument is packed whole and stands erect in a nicely finished mahogany box, which is provided with a lock and strong leather strap and contains sun-shade, plumb bob, magnifying glass and adjusting pins.

No. 6165.	Reconnoissance Transit, with light extension tripod, box, etc., ...	Each,	$120 00
6166.	Reconnoissance Transit, like No. 6165, but with 4½ in. *vertical circle*, divided to half-degrees, with vernier reading to one minute; light extension tripod, box, etc.,	Each,	125 00

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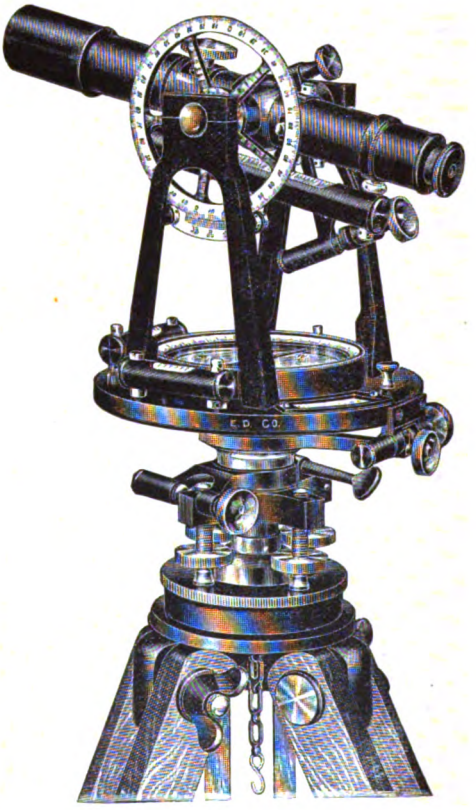
LIGHT RECONNOISSANCE TRANSIT



No. 6167.

Light Reconnoissance Transit, as shown above, is an inexpensive, convenient and serviceable transit for preliminary work. In general appearance and design it resembles our No. 6165 Reconnoissance Transit, but is built lighter and lower with the object of decreasing the weight. Its portability has caused it to be very popular.

For complete specifications, see next page.

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LIGHT RECONNOISSANCE TRANSIT *Continued*

SPECIFICATIONS

Telescope — Length, 8 inches; magnifying power, 16 diameters; achromatic terrestrial, of good definition; balanced, and reverses at both ends; line of collimation true for all distances; object slide and eye-piece provided with *dust protectors;* fixed stadia hairs.

OBJECT GLASS — Diameter, 1 inch, used to its full value.

EYE-PIECE — Improved, giving a flat field; provided with a screw-like arrangement for precise focusing of cross hairs.

HORIZONTAL AXIS — Length, 3¼ inches; hardest bell metal, cast hollow to reduce weight.

LEVEL TO TELESCOPE — Length, 4½ inches; graduated on the glass, indicating a variation of 40 seconds of arc to $\frac{1}{10}$ inch motion of the bubble.

Vertical Circle — Diameter, 3½ inches; *silvered;* graduated to degrees, reading 0 to 90 each way, with vernier reading to 2 minutes.

Standards — Phosphor bronze; rigid, and ribbed to reduce weight.

Horizontal Circle — Diameter, 5 inches to edge of graduation; graduated on *solid silver* to half-degrees, with one double vernier reading to single minutes, placed at an angle of 30° to line of sight; marked from 0 to 180 each way.

Compass — Graduated to half-degrees, figured from 0 to 90 on each side of North and South; graduation and inside face of compass *silvered;* magnetic needle, 3½ inches, hardened and tempered steel; variation plate with vernier and rack and pinion.

Plate Levels — Length, $1\frac{5}{16}$ inches; indicating a variation of 1 minute of arc to $\frac{1}{10}$ inch motion of the bubble.

Tangent Screws — Phosphor bronze; improved form, with opposing spiral spring; well protected but accessible to either hand.

Center — Of substantial design, in harmony with the general construction and quality of the instrument.

Parallel Plates — Of large diameter, the upper plate consisting of four well-braced arms; *four* leveling screws.

SHIFTING CENTER — Range of shift, ½ inch.

Finish — Standards, cloth-finished; all other parts bronzed and lacquered.

Weight — Instrument, 7 pounds; tripod, 9 pounds.

The Instrument is packed whole and stands erect in a nicely finished mahogany box, which is provided with a lock and strong leather strap and contains sun-shade, plumb bob, magnifying glass and adjusting pins.

No. 6167. Light Reconnoissance Transit, with light extension tripod, box, etc., ... Each, $115 00

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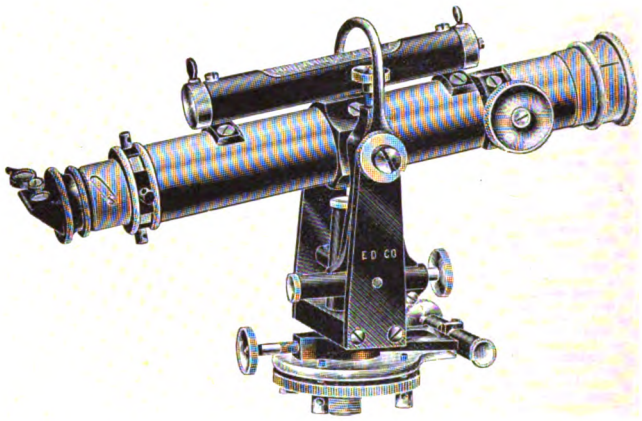
IMPROVED SAEGMULLER SOLAR ATTACHMENT



No. 6168.

No. 6168 represents the improved solar attachment as now made. It consists essentially of a small telescope and level, the telescope being mounted in standards, in which it can be elevated or depressed. The standard revolves around an axis, called the polar axis, which is fastened to the telescope axis of the transit instrument. The telescope called the "Solar Telescope" can thus be moved in altitude and azimuth. Two pointers attached to the telescope to approximately set the instrument are so adjusted that when the shadow of the one is thrown on the other the sun will appear in the field of view.

ADJUSTMENT OF THE APPARATUS

1. The Transit must be in perfect adjustment, especially the levels on the telescope and the plates; the cross axis of the telescope should be exactly horizontal, and the index error of the vertical circle carefully determined.

2. The polar axis must be at right angles to the line of collimation and horizontal axis of main telescope.

To effect this, level the instrument carefully and bring the bubble of each telescope level to the middle of its scale. Revolve the Solar around its polar axis, and if the bubble remains central the adjustment is complete. If not, correct half the movement by the adjusting screws at the base of the polar axis, and the other half by moving the solar telescope on its horizontal axis.

3. The line of collimation of the solar telescope and the axis of its level must be parallel.

To effect this, bring both telescopes in the same vertical plane and both bubbles to the middle of their scales. Observe a mark through the transit telescope, and note whether the solar telescope points to a mark above this, equal to the distance between the horizontal axes of the two telescopes. If it does not bisect this mark, move the cross wires by means of the screws until it does. Generally the small level has no adjustments and the parallelism is effected only by moving the cross hairs.

The adjustments of the Transit and the Solar should be *frequently* examined, and kept as nearly perfect as possible.

DIRECTIONS FOR USING THE ATTACHMENT

First. Take the declination of the sun as given in the Nautical Almanac for the given day, and correct it for refraction and hourly change. Incline the *transit telescope* until this amount is indicated by its vertical arc. If the declination of the sun is north, depress it; if south, elevate it. Without disturbing the position of the transit telescope, bring the solar telescope into the vertical plane of the large telescope and to a horizontal position by means of its level. The two telescopes will then form an angle which equals the amount of the declination, and the inclination of the solar telescope to its polar axis will be equal to the polar distance of the sun.

Second. Without disturbing the *relative* positions of the two telescopes, incline them and set the vernier to the co-latitude of the place.

By moving the transit and the "Solar Attachment" around their respective *vertical* axes, the image of the sun will be brought into the field of the solar telescope, and after accurately bisecting it the *transit telescope must be in the meridian, and the compass-needle indicates its deviation at that place.*

The vertical axis of the "Solar Attachment" will then point to the pole, the apparatus being, in fact, a small equatorial.

No. 6168. Improved Saegmuller Solar Attachment, ... Each, $45 00

This price includes attaching when furnished with new Instruments.

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ACCESSORIES

PLAIN TRANSIT

Improved Solar Attachment, as described under No. 6168,	$45 00
Vertical Circle, 5 in. diameter, graduation on solid silver, reading to 1 minute,	20 00
Vertical Arc, graduation on solid silver, reading to 1 minute,	20 00
Level to Telescope,	10 00
Reversion Level,	20 00
Clamp and Tangent Screw to Axis,	10 00
Graduation, reading to 20 seconds,	20 00
Fixed Stadia Wires, to cover 1′ in 100′ on any rod,	3 00
Variation Plate, with rack and pinion,	10 00
Variation Ring, with index point,	5 00
Gradienter Screw,	4 00
Ground Glass Vernier Shades,	3 00
Aluminum Guard, cloth-finished, for vertical circle, as shown in cut No. 6066,	4 00
Double Opposite Vernier Attachment, for vertical circle with cloth-finished aluminum guard,	20 00

MOUNTAIN AND MINING TRANSIT

Improved Solar Attachment, as described under No. 6168,	$45 00
Davis Solar Attachment, complete, with prism and sun-shade,	18 00
Auxiliary Side or Top Telescope,	35 00
Vertical Circle, 5 in. diameter, graduated on solid silver, reading to minutes,	20 00
Double Opposite Vernier Attachment, for vertical circle with cloth-finished aluminum guard,	20 00
Detachable Reading Glass for vertical circle,	5 00
Detachable Reading Glasses for horizontal limb,	15 00
Prism, attachable to eye-piece,	8 00
Prism, combination pivoted, with colored glasses,	12 00
Reversion Level, in place of ordinary level,	10 00
Gradienter Screw,	4 00
Fixed Stadia Hairs,	3 00
Disappearing Stadia Hairs,	4 00
Reflector for illuminating cross hairs,	4 00
Colored glass in eye-piece slide,	2 00
Aluminum Guard, cloth finished, for vertical circle, as shown in cut No. 6066,	4 00
Gossamer Cover for instrument,	1 00
Sole Leather Cover for case, with shoulder straps,	12 00
Three Leveling Screws in place of 4 to any Mountain and Mining Transit,	15 00

LIGHT MOUNTAIN TRANSIT

Auxiliary Side or Top Telescope,	$35 00
Double Opposite Vernier Attachment, for vertical circle with cloth-finished aluminum guard,	20 00
Detachable Reading Glass for vertical circle,	5 00
Detachable Reading Glasses for horizontal limb,	15 00
Prism, attachable to eye-piece,	8 00
Prism, combination pivoted, with colored glasses,	12 00
Reflector for illuminating cross hairs,	4 00
Colored glass in eye-piece slide,	2 00
Gossamer Cover for instrument,	1 00
Sole Leather Cover for case, with shoulder straps,	11 00

TRANSIT THEODOLITE

Full 5 in. Vertical Circle, graduated on silver, reading to minutes,	$25 00
Full 5 in. Vertical Circle with cloth-finished aluminum guard, double verniers, reading to minutes,	40 00
Graduation on Horizontal Limb, reading to 20″,	10 00
Graduation on 7 in. Horizontal Limb, reading to 10″,	30 00
Reversion Level, in place of ordinary level,	10 00
Attached Reading Glasses to vertical circle,	8 00
Variation Ring with index point and rack and pinion movement,	8 00
Attached Reading Glasses to verniers,	15 00
Striding Level,	15 00
Gradienter Screw,	4 00
Gossamer Cover for instrument,	1 00

For Tripods, see Nos. 6200-6215.

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PRICES OF PARTS OF INSTRUMENTS

Needle, of best design, having the largest breadth in a vertical direction,	Each,	$4 00
Center Point, for needle,	"	75
Center Cap, with jewel, for needle,	"	1 50
Cap, for eye-piece or object glass,	"	1 00
Shade, for object glass,	"	75
Clamp Screws, for horizontal circle, telescope or lower tangent,	"	75
Tangent Screws, " " " " " " "	"	1 50
Leveling Screws,	Per set, $5.00, "	1 50
Object Glass, best quality (mounted), for Transits or Levels,	$6 00 to	10 00
Eye Lens and setting, for any eye-piece,	Each,	1 50
Neutral Glass, dark, to eye-piece,	"	2 00
Neutral Glass, light, to eye-piece,	"	2 00
New Cross Hairs and adjusting,	"	2 00
New Cross Hairs with Diaphragm and adjusting,	"	2 75
Fixed Stadia Hairs to any instrument,	"	5 00
Glass cover for Compass,	Each, $0 50 to	1 00

MISCELLANEOUS

Mahogany Case, highly finished, with lock, hooks and leather strap, fitted for Transit or Level,	Each,	$7 50
Bolts, for tripod head, complete,	"	75
New Tripod Head, without bolts,	"	5 00
Wooden Cap, for tripod,	"	75
Metal Cap, for tripod,	"	1 35
Chamois Skin, large size, best quality,	"	65
Gossamer Cover, for Transit or Level,		1 00
Bottle of Watch Oil, for lubricating centers,	"	25
Adjusting Pins, of best tempered steel,	"	10
Regraduating vertical circle and vernier to degrees, reading to 2 minutes	Each,	6 00
Regraduating vertical circle and vernier to half-degrees, reading to 1 minute,	Each,	8 00
Regraduating vertical circle and vernier to 20 minutes, reading to 20 seconds,	Each,	10 00
Regraduating vertical circle and vernier to 10 minutes, reading to 10 seconds,	Each,	18 00
Regraduating horizontal circle and vernier to 20 minutes, reading to 30 seconds,	Each,	10 00
Regraduating horizontal circle and vernier to 20 minutes, reading to 20 seconds,	Each,	12 00
Regraduating horizontal circle and vernier to 10 minutes, reading to 10 seconds,	Each,	20 00

For Spirit Levels, see Nos. 6180-1-7.

For Tripods and Parts, see Nos. 6200-6215.

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REPAIR OF INSTRUMENTS

As our central location requires us to repair all the various makes of instruments in the country, while Eastern establishments, as a rule, only repair their own, we were obliged to procure all the material, patterns, tools, etc., necessary for these. Having the patterns for all those parts which often want to be replaced when injured by falls, such as the axis to the telescope, centers, etc., facilities for cutting any threads from 5 to 100 to an inch; object glasses and eye-piece lenses of any desired focus; level vials of every diameter and length; we are prepared to do the work as economically and promptly as the maker himself can do it.

Instruments sent to us are always thoroughly overhauled and put in as good a condition as possible, unless directions are given specifying the repairs desired. We believe that the best policy, insuring satisfaction and a saving of money, is to leave it to our judgment, as there are often points appearing trivial to the engineer, but which must be corrected if the instruments are to be relied on.

A good deal of correspondence arises about the cost of repairs, and although it is impossible to state the exact figures, we will give a general idea of such here.

The most costly instrument to repair is the Transit, being the most complicated. If injured by a fall, new centers and new axis to telescope are generally required, the cost extending from $10 to $30, or sometimes even $50. If slightly injured, the cost will vary from $5 to $10.

Injuries to leveling instruments sustained by falling are generally less serious, ranging in cost from $5 to $10.

The cost of repolishing, bronzing and lacquering an instrument, varies according to condition, but may be stated generally as follows:

Surveyors and Railroad Compasses, ...	from	$	5 00	to	$10 00
Transits and Theodolites, ...	"		15 00	"	25 00
Y Levels, etc., ...	"		10 00	"	15 00

It must be understood that the above prices are in addition to cost of necessary repairs and adjustment of the instrument.

Transits and Levels should always be accompanied by the leveling plates; the legs and the head to them need not be sent. With compasses, the ball spindle should be sent along. We advise our customers to carefully pack instruments sent to us for repairs, as they might sometimes be injured by neglecting this precaution. When an instrument is sent to us, a letter or postal card should always be mailed the same day, giving us the directions and stating when the return is required.

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THE VERSCHOYLE POCKET TRANSIT

Patented.

No. 6169.

This Instrument combines the useful features of the Abney Level, Prismatic Compass and Clinometer, and was designed by a mining engineer of practical experience in the use and possible application of the various forms of instruments intended for preliminary survey.

Owing to its novel construction, only one observation is necessary to obtain both the magnetic bearing and the vertical angle of any distant point. It is also specially adapted for use in difficult positions, such as are always liable to occur in filling in the rougher details in a mining survey.

To use the instrument for obtaining horizontal and vertical angles, after freeing the needle and unfolding the arm, grasp the compass box in the left hand, and then with the extended fingers of the right hand lightly grasp the arm and bring the distant target or light to the intersection of the cross lines at the end of the arm. When holding the arm firmly in that position, with the left hand slightly revolve the compass box until the small level bubble is seen through the prism to be at the central mark. The magnetic bearing will now be plainly visible in the prism at the same time that the target is viewed along the sight line, and the angle of depression or elevation is automatically recorded on the vertical arc. Both readings can then be booked at the same time without further observation.

To use the instrument as a clinometer, lay the bottom side of the arm on the object to be observed, and looking through the window at the top of the compass box slightly revolve the box until the small bubble comes to the center. The angle may then be read off the vertical arc.

Should it be necessary to alter the relative position of the divided ring and the magnetic needle, this can be accomplished by removing the cover and altering the position of the needle immediately under the divided ring. Adjustment for magnetic variation may be obtained in this manner, without liability to disturb other adjustment.

Designed as a thoroughly serviceable instrument, it is constructed to withstand rough usage and is not liable to derangement or deterioration. There are no reflectors or mirrors used other than the prism, which is protected and fastened in a secure manner.

No. 6169. Verschoyle Pocket Transit, bronzed brass, 3⅜ in. diam., needle about 2¼ in., aluminum ring graduated to half degrees, arc giving vertical angles graduated to degrees. Weight of instrument about 15 ounces, in leather sling case, Each, $40 00

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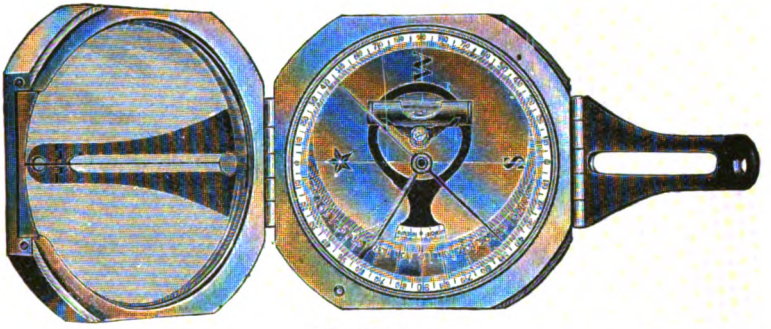
THE BRUNTON PATENT POCKET TRANSIT



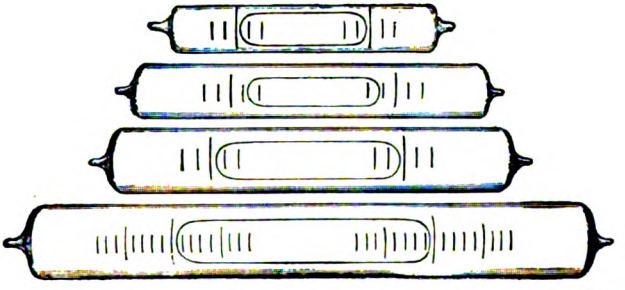
No. 6170.

A complete, accurate and reliable pocket instrument for the taking of topography and preliminary surveys of every description, either on the surface or underground; thus taking the place of a sighting compass, clinometer, prismatic compass and Abney level, and combining them as it does in one light and handy instrument.

The case is made of aluminum, $2\frac{3}{4} \times 2\frac{3}{4} \times 1$ inch. Weight of instrument about 8 ounces.

No. 6170. Brunton Patent Pocket Transit, with directions, . . . Each, **$25 00**

SPIRIT LEVELS



	Length from tip to tip, in inches.	Diameter, in inches.		Mounted in tube, if same is furnished, Each.
No. 6180–1.	6.50 to 6.60	0.75 to 0.80,	for Y Level Telescopes, . . .	$4 00
6180–2.	4.75	0.65 to 0.68,	for Engineers' Transit Telescopes,	3 00
6180–3.	4.10	0.58 to 0.60,	for Mountain Transit Telescopes,	2 50
6180–4.	3.00 to 3.50	0.54 to 0.56,	for Light Mt. Transit Telescopes,	2 00
6180–5.	2.00 to 2.25	0.50 to 0.53,	for Engineers' Transit Plates, .	1 00
6180–6.	1.75 to 1.85	0.44 to 0.47,	for Mountain Transit Plates, .	1 00
6180–7.	1.50	0.37 to 0.40,	for Light Mountain Transit Plates,	1 00

Levels different in size from this list can be made to order only, and will be furnished only when order is accompanied with *the tube or mounting for which one is intended, and also stating the kind of instrument it is for, and the degree of sensitiveness required.* We will positively not make any levels upon written dimensions only, but require the tube to be sent in all cases, as otherwise we will not be responsible for any failure in that respect.

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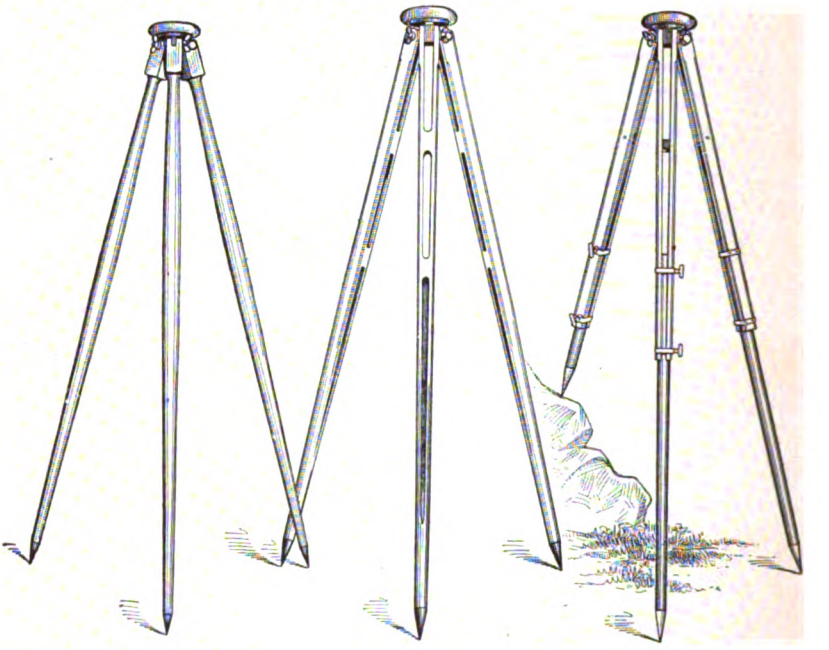
TRIPODS

For Levels and Transits.



No. 6200. 6204. 6206.

No. 6200.	Solid Leg Tripod, hardwood, for Levels and Transits, Each,	$10 00
6202.	" " " " light, for Architects' Levels, "	6 00
6204.	Split " " " for Dumpy Levels, "	12 00
6205.	" " " " " Wye Levels and Transits, "	12 50
6206.	Extension " " " " " " "	15 00
6207.	" " " " Mountain Transits, "	15 00
6208.	" " " " Light Mountain Transits,"	15 00
6210.	Solid Tripod Legs, heavy, . Per set of 3, $ 5 00; "	1 75
6211.	" " " light, . . " 3, 4 25; "	1 50
6212.	Split " " heavy, . " 3, 7 00; "	2 50
6214.	Extension Tripod Legs with clamps, heavy, Per set of 3, 10 00; "	3 65
6215.	Extension Tripod Legs with clamps, light, Per set of 3, 9 50; "	3 50

The Solid and Split Leg Tripods have a little spur at the points.

For Jacob Staff and Tripods for Compasses, see Nos. 5958-5960.

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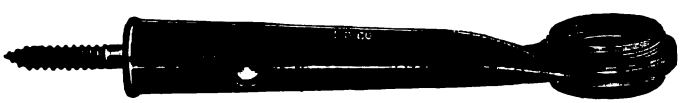
UNDERGROUND TRIVET

No. 6220.

This Trivet is cast of bronze, substantial and well made, and can be used with our transits (with or without a compass) and levels in underground and mining work. It is designed so that a small plumb bob can be used with it.

No. 6220. Underground Trivet, ... Each, $3 50

TIMBER BRACKETS



No. 6225.

We have designed these Brackets for the support of transits or levels under conditions where the use of the tripod is impossible. They are made of bronze, very strong and rigid, and will permit the centering of an instrument above or below a given point. The instrument is screwed upon them in the same manner as on a regular tripod. They are especially valuable for mining work. An auger and a bracket lever is furnished with each Bracket.

No. 6225. Bracket for our large size Mining Transits and Levels, with auger and bracket lever, ... Each, $15 00

6226. Bracket, like No. 6225, but for Light Mountain and Mining Transits, ... Each, 14 00

In ordering Timber Brackets or Underground Trivet, state the catalogue number or the serial number of our instrument with which they are to be used.

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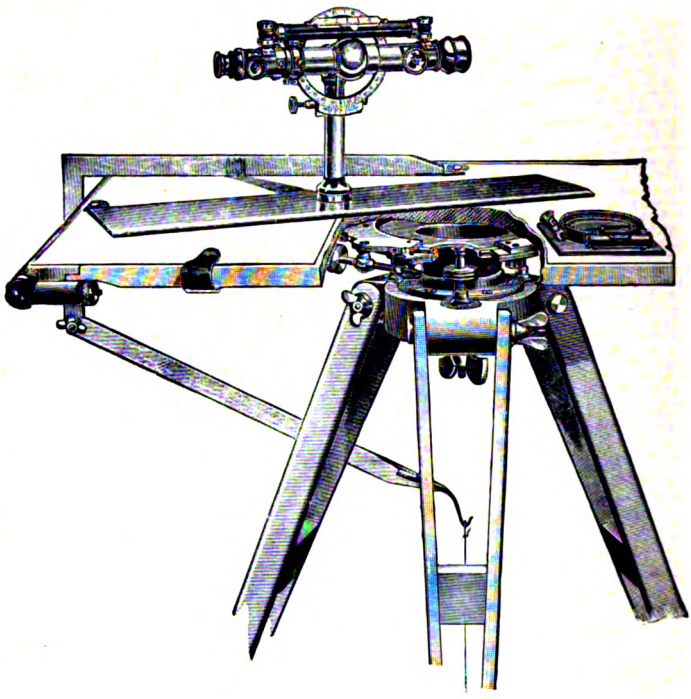
PLANE TABLES



No. 6230.

No 6230. Plane Table, board 24 × 30 inches, mounted on large tripod, with leveling-socket and clamp, and with plumbing-arm, plummet and clamps for paper; set of three leveling screws, clamp and tangent for movement in azimuth, combined compass and levels with square base. Alidade, with telescope 11 in. long, magnifying power of 24 diameters, with stadia; vertical circle, 4½ in., with vernier reading to one minute; level on telescope and clamp and tangent screw.

No. 6230. Plane Table, complete, ... Each, $170 00

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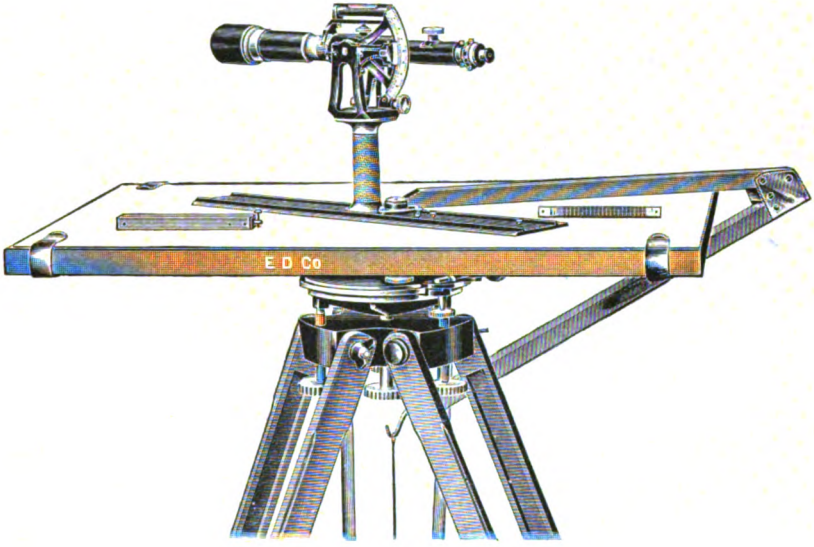
PLANE TABLES *Continued*



No. 6235

No. 6235. Plane Table, as made by us for the U. S. Coast and Geodetic Survey; *telescope*, 16 in. long, made of drawn aluminum tubing, magnifying power 36 diam., *object glass*, $1\frac{7}{16}$ in. diam., *eye-piece* achromatic astronomical (inverting), improved rack and pinion movement, fixed stadia hairs, dust cap and sun-shade. The telescope is mounted in a bronze sleeve and can be turned about its horizontal axis to bring the cross hairs into their optical axis.

Vertical arc to telescope reading 35° both ways, graduated on beveled solid silver to $\frac{1}{3}$ degrees, with vernier reading to single minutes, clamp and improved tangent screws; *striding spirit level* to telescope $3\frac{1}{2}$ in. long, graduated on the glass, sensitiveness $\frac{1}{1\frac{1}{2}}$ in. motion of bubble to 20 seconds of arc; *aluminum bronze alidade*, 21 in. long and $3\frac{1}{8}$ in. wide, with a fine circular spirit level; *compass* divided for about 8° each way, oblong box of aluminum, graduated to half-degrees, improved needle about $5\frac{1}{2}$ in. long, with lifter; *diagonal scale*, $5\frac{1}{2}$ in. long and $1\frac{1}{8}$ in. wide, of hard rolled German silver, divided $\frac{1}{1000}$ and $\frac{1}{2000}$ meters; *drawing board* 24×31 in., selected white pine, of best workmanship; *plumbing arm* collapsible, of improved design; *brass nickel-plated clamps* for holding the paper; *tripod leveling head* of aluminum, very light and absolutely rigid, with extra wide lugs. The three screw leveling arrangement with improved tangent screw is of the highest grade and of an entirely new design.

No. 6235. Plane Table, complete, in two strong boxes; with split-leg tripod, ... Each, **$175 00**

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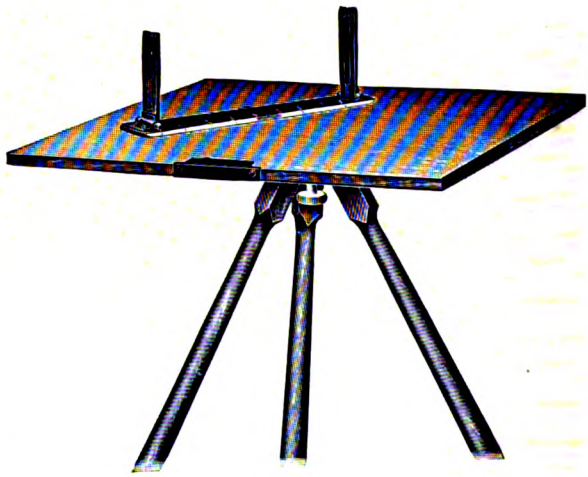
TRAVERSE PLANE TABLE

U. S. Geological Survey Pattern



No. 6240.

No. 6240. Traverse Plane Table is suitable for preliminary work, and on account of its portability is especially adapted for use by topographers.

The *drawing board*, 15 in. square, of superior finish and made of selected pinewood, is fastened to the tripod by means of a brass flanged ring, which fits the head of clamp screw connected with the tripod head; into one edge of the board is set a small *trough compass*, provided with a 3 in. needle, jewel-center, with ex-center stop; the *alidade*, provided with folding sights, is 10 in. long, brass, bronzed, with the beveled edge graduated to a scale of 40 parts to the inch; the *tripod* is similar to our No. 5960, but with special head and strong, detachable clamping screw with spring.

No. 6240. Traverse Plane Table, complete, with leather sheath for Alidade, ... Each, $25 00

6242. Brass Alidade only, as furnished with No. 6240, in leather sheath, ... Each, 8 00

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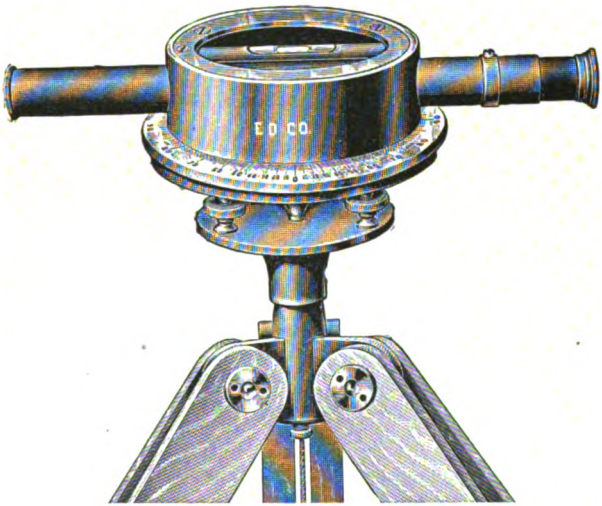
BOSTROM'S BUILDERS' LEVEL

For Builders, Carpenters and Stone Masons



No. 6306.

An absolutely reliable leveling instrument for Builders, Carpenters and Stone Masons. Can be used for any kind of foundation work and getting angles, is simple in construction, easily understood, and can be operated by any one. Is made of brass, oxidized, with a silvered circle graduated to degrees, an achromatic telescope of good power, and a sensitive ground level vial.

No. 6306. Bostrom's Builders' Level, with plumb bob, tripod and graduated rod with target, ... Each, $25 00

6307. Bostrom's Builders' Level, like No. 6306, but with more powerful telescope and rack and pinion to eye-piece; plumb bob, tripod and graduated rod with target, Each, 30 00

BOSTROM'S FARM LEVEL

This instrument is particularly adapted for farm use, for terracing, ditching, irrigation and drainage work. It possesses the latest patented improvements in simplicity and usefulness and can be operated by any one. Is made of iron and black enamel. The sliding telescope tube and spirit level are of polished and lacquered brass. The circle is graduated to degrees.

No. 6308. Bostrom's Farm Level, with plumb bob, tripod and graduated rod with target, ... Each, $15 00

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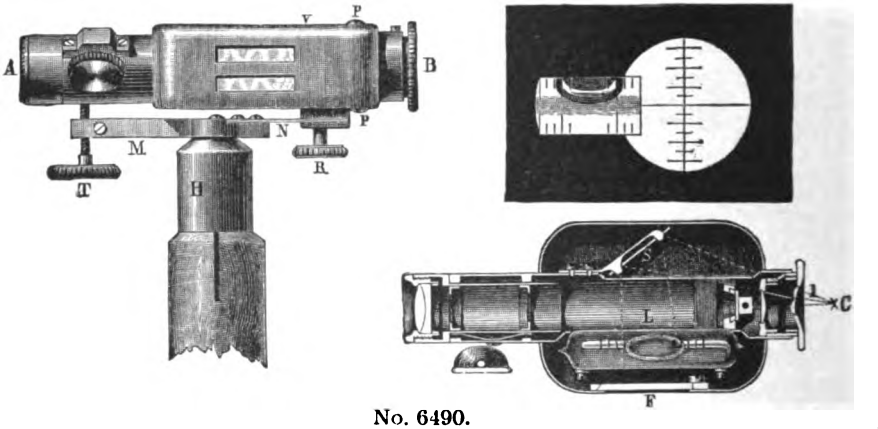
POCKET LEVELING INSTRUMENT

WITH REVERSION LEVEL.



No. 6490.

For the use of engineers in reconnoissance work and filling in topographical details; capable of close results. The instrument is fitted with a reversion level and has, as compared with other designs, a striding level, the important advantage being that it dispenses with the inconvenience of adjusting the level, also with the reversing of the telescope in its wyes.

The telescope magnifies 12 times; its definition is such that less than one-half an inch can be read off at a distance of 300 feet. The degree of accuracy is 1-20000 of the distance.

The reversion level is encased and protected from external influences; the bubble is directly visible in the field of the eye-piece; the whole is mounted on a light tripod with a ball and socket joint.

This instrument, which is intended for accurate measurements, can be used without preliminary adjustment. The manipulation is very simple, and is done thus: set up the instrument with the level on the left and take a reading; unscrew the milled-headed screw by which it is fastened to the horizontal bar carrying the micrometer screw; turn the instrument upside down with the level on right and fasten in place; take another reading and the arithmetical mean is the correct value.

No. 6490. Pocket Leveling Instrument, complete, in case, . . . Each, **$42 00**

LOCKE'S HAND LEVELS

No. 6500.

No. 6500.	Locke's Hand Level, German Silver, in leather case, 5 in., Each,	$7 50
6500B.	" " " Bronzed, in leather case, 5 in., "	7 00
6501.	" " " Brass, nickel-plated, in leather case, 5 in.,	6 00
6501B.	Locke's Hand Level, Brass, plain, in leather case, 5 in., "	5 00

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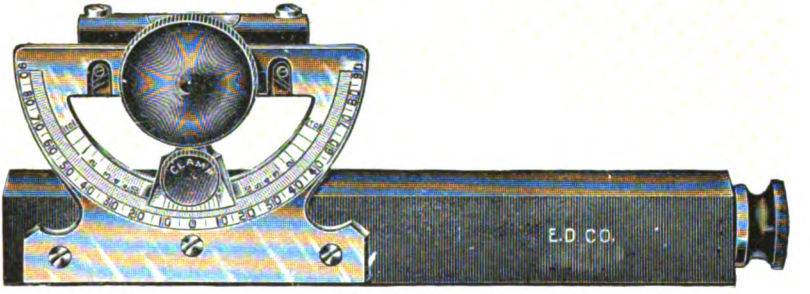
HAND LEVELS

Continued

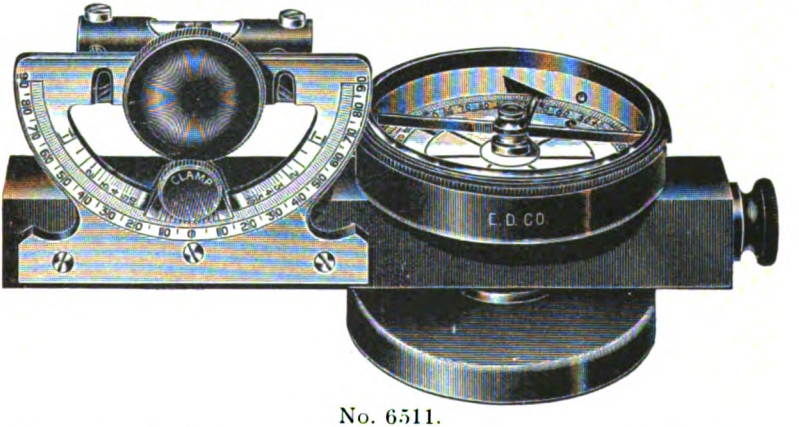
No. 6502.

No. 6502. Hand Level, square tube, bronzed, 5 inch, ... Each, **$4 50**



No. 6510.

No. 6510. Abney's Reflecting Level or Pocket Altimeter, square bronzed sighting tube 5 in., vertical arc 1 in., graduated 90° in each direction to single degrees, folded vernier reading to 5 minutes, scale of grades from 1:1 to 1:10, 1 in. bubble, in leather pocket case, . . Each, **$13 50**



No. 6511.

No. 6511. Abney's Reflecting Level or Pocket Altimeter, 5 in., with divided arc to show angles, and with bar needle compass and socket for Jacob staff, in case. . . . . Each, **$18 00**

These instruments are used for getting the height of buildings, trees, hills, etc., and also for fixing the slopes or gradients of rails for railways, the rise and fall for drainage purposes, and all operations where angular distance or inclination of surface is wanted.

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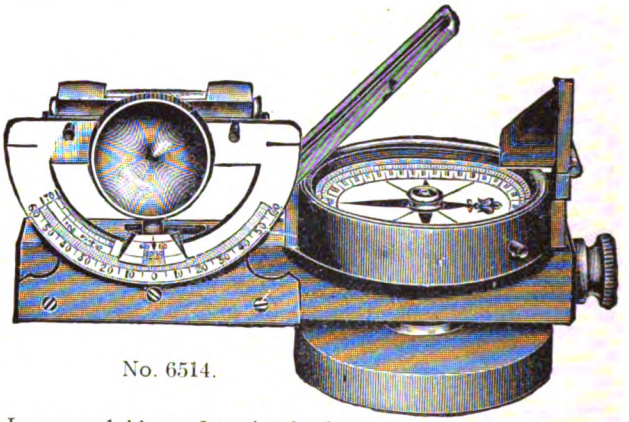
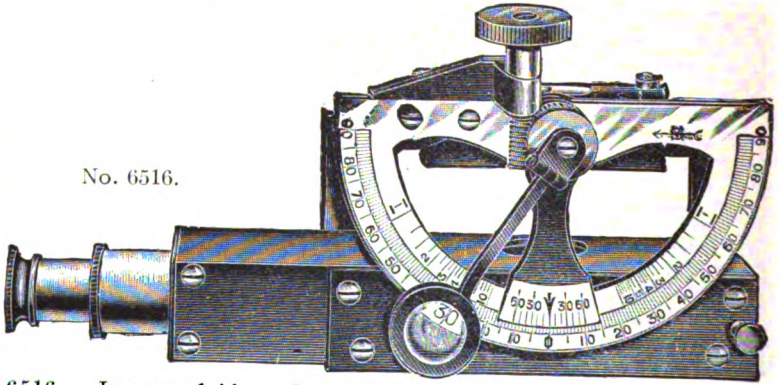
HAND LEVELS

Continued



No. 6514.

No. 6514. Improved Abney Level, 5 in. long, combined with prismatic card dial compass, in leather sling case, . . . Each, $28 50



No. 6516.

No. 6516. Improved Abney Level with rack movement. This instrument has an extra large arc divided 0° to 90° each way, with magnifying lens on movable arm and vernier reading to 10 minutes; double draw eye-piece and double reading grade scale. By the rack and pinion movement it can be precisely and easily adjusted. In leather sling case, Each, $32 50

No. 6518.

No. 6518. Stadia Hand Level, telescope 10 in., with object glass 1 in., adjustable eye-piece, stadia hairs reading 1:100, with ball joint and socket. This instrument will be found very useful for preliminary surveys, etc.; weight about 1½ lbs., in leather sling case, ... Each, $18 00

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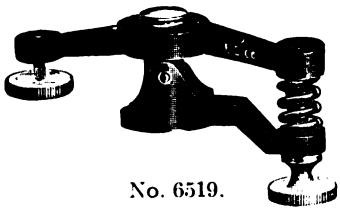
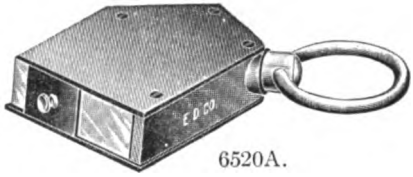
LEVELING ATTACHMENT
PENTA-PRISM RANGE FINDER



No. 6519.



6520A.

No. 6519. Leveling Attachment, bronzed brass, in leather case; for use with Abney Levels, etc., ... Each, $ 3 00

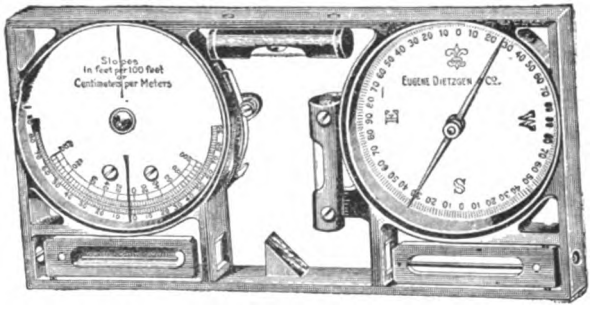
6520A. Penta-Prism Range Finder, bronzed metal frame, in leather case, with Directions, ... Each, 10 00

6520B. Metallic Tape, Leather Case, ⅜ in. wide, 20 yds. long graduated to read 1000 yds. by single yards; for use with No. 6520A Penta-Prism Range Finder, . . . Each, 4 00

The Penta-Prism Range Finder will be found invaluable by surveyors and military officers for measuring distances and determining right angles. Distances up to two miles can be quickly measured, without the aid of any other instrument or referring to tables. As the instrument consists of but one prism, it has an advantage over other makes consisting of several prisms, as the view is more brilliant and the accuracy greater. Its use is easily understood, and the results are of sufficient accuracy to meet all general requirements.

The distance is obtained by measuring the base line (see base line measuring tape, as listed above), as determined by the prism, and multiplying by 50.

DIETZGEN POCKET OMNIMETER



No. 6520½.

No. 6520½. Dietzgen Pocket Omnimeter, with folding Sights, in sole leather case, ... Each, $18 00

The Pocket Omnimeter combines a Compass, Clinometer, Hand Level, Plumb, Alidade and Contact Level; it will indicate magnetic bearings, azimuth angles, altitudes, levels and slopes. The instrument is also provided with sights for azimuth angles of objects not in the horizontal plane. The rectangular frame of aluminum alloy, 5¼ x 2¼ x 1½ in., weighs 7 ounces, and serves also as fiducial edge. Compass 2 in. in diameter, graduated to 2 degrees, numbered in quadrants at every 10 degrees; needle with jewel-center and stop. Gravity Clinometer 2 in. in diameter, graduated to 2 degrees and to slopes in feet per 100 feet horizontal or centimeters per meter. The prism of the hand level is attached to one of the long sides, and its spirit level is on the opposite side of the frame. The spirit level is as sensitive as is permissible in a hand level.

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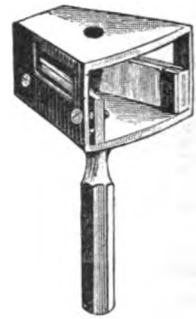
ANGLE MIRRORS

No. 6521.



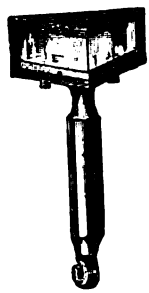
6522.

No. 6521. Angle Mirror, for right angles, with small plumb bob. Size of instrument when packed, $3\frac{1}{4} \times 2 \times 1\frac{3}{4}$ in., in case, Each, $7 50

6522. Angle Mirror, for right angles, plain, in case, ... " 5 00

ANGLE PRISMS

No. 6523.



6524.

6525.

6526.

No. 6523. Rectangular Prism, for angles of 90 degrees, $1 \times \frac{3}{4} \times \frac{3}{16}$ in., in morocco case, ... Each, $ 4 50

6524. Rectangular Prism, for angles of 90 degrees, $1\frac{3}{16} \times \frac{5}{8} \times \frac{3}{8}$ in., in morocco case, ... Each, 5 00

6525. Double Prism, for angles of 90 and 45 degrees, in morocco case, ... Each, 10 00

6526. Angle Prism, $1\frac{5}{8} \times 1\frac{1}{2} \times 1\frac{1}{4}$ in., with cover folding back to serve as handle, ... Each, 6 00

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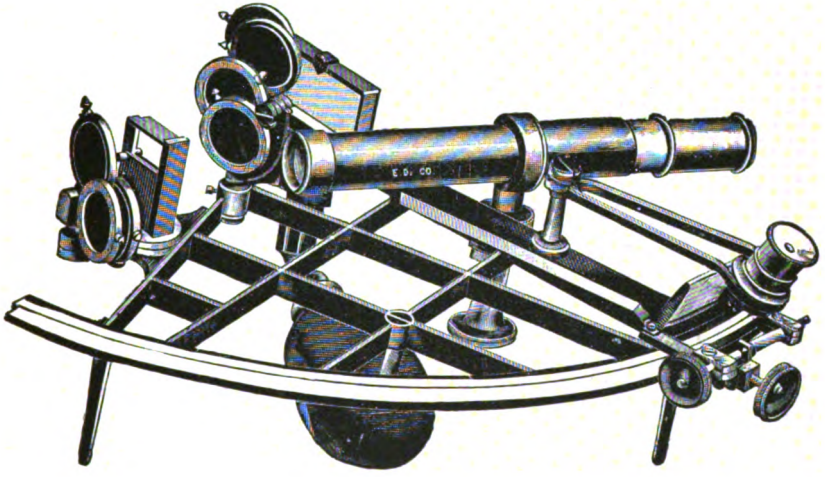
SEXTANTS



No. 6536.

No. 6536. Sextant, radius 7 inches, 145 degrees; four sun-glasses between the large and small reflecting mirror, and three sun-glasses behind the small reflecting mirror, all of which can be turned on their axes 180 degrees; graduation on solid silver, reading to 10 seconds; telescope ¾ in. aperture; two astronomical eye-pieces with powers of 6 and 10 dia. One Galilean telescope with extra large objective, power 3 dia.; one fixed reading glass; two sights for examination and correction of the large reflecting mirror. All complete in a box, ... Each, **$120 00**

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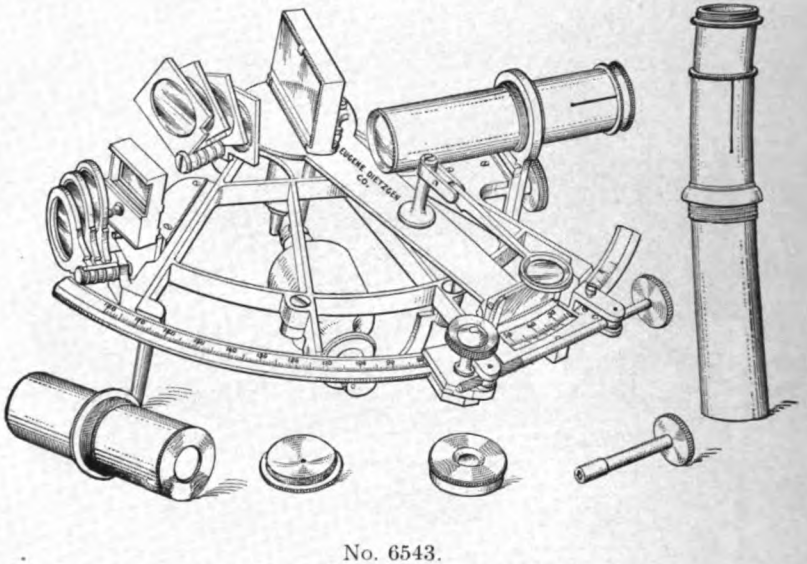
SEXTANTS AND OCTANTS



No. 6543.

No. 6543. Surveying Sextant, of gun metal, as made by us for the U. S. Navy, measuring angles up to 130 degrees. Radius 5¾ in. Graduations on inlaid silver to 20 minutes, vernier reading to 30 seconds. 1 sighting tube, 1 star telescope, one inverting telescope, magnifying power of 6 diameters. 7 neutral glasses to sextant, 2 neutral glasses for telescope and one each spare index and horizon mirror.

Instrument complete with two screw drivers, in polished mahogany case with lock and key, ... Each, **$90 00**

6545. Octant of gun metal, as made by us for U. S. Navy, measuring angles up to 100 degrees. Graduations on inlaid silver to 20 minutes, vernier reading to 30 seconds, magnifying glass, clamp and tangent screw to vernier, 1 sighting tube, 1 star telescope, 7 neutral glasses to octant, 2 neutral glasses for telescope, 1 each spare index and horizon mirror.

Instrument complete with two screw drivers, in polished mahogany case with lock and key, ... **Each, 80 00**

No. 6547. *Poc*
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No. 6548. Pocket *Alt-Azi*
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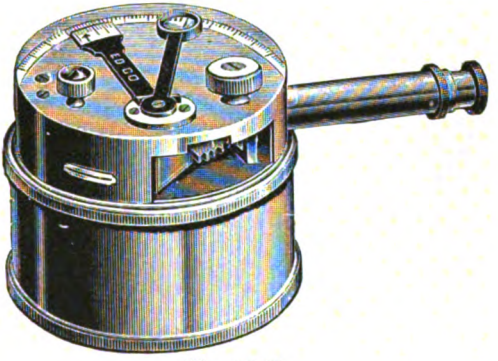
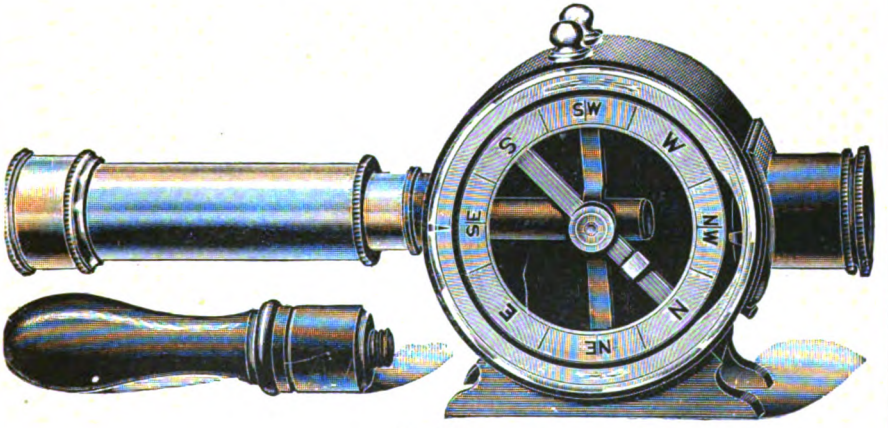
POCKET SEXTANT



No. 6547.

No. 6547. Pocket Sextant, divided on silver to 30 minutes, vernier reading to 1 minute, with telescope, 2 neutral glasses, reading lens, and micrometer tangent screw. Metal box 3 inches in diameter by 1½ inches high, in leather sling case, Each, **$40 00**

POCKET ALT-AZIMUTH



No. 6548.

No. 6548. Pocket Alt-Azimuth, for Travelers and Military Surveyors; altitudes, azimuths, compass bearings, Clinometer degrees and levels, all are obtainable by this handy and accurate little instrument. The advantages of its use have been so increased by the recent addition of an excellent telescope as to make it perfect for the various purposes to which it can be applied. Size of instrument 6½ inches long, 2½ inches in diameter, 1⅛ inches thick, weight 13 ounces, in morocco case, ... Each, **$47 00**

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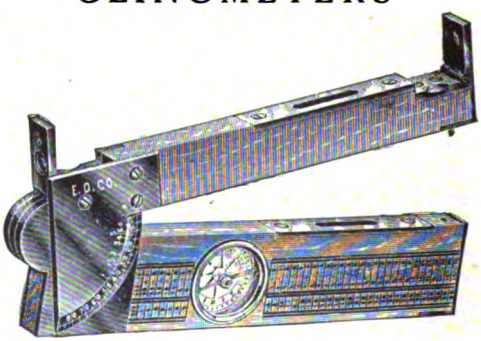
CROSS STAFF HEADS

No. 6550.

No. 6550.	Cross Staff Head, octagonal, for Jacob staff, 2½ in., in case, ... Each,	$ 2 70
6552.	Cross Staff Head, octagonal, for Jacob staff, with magnetic compass, 3 in. needle, 1¾ in., ... Each,	4 50
6554.	Cross Staff Head, like No. 6552, with vertical axis and divided circle, to take angles, 3⅜ in., needle, 2⅛ in. Each,	11 50

For Jacob Staff and Tripods, see Nos. 5958-5960.

CLINOMETERS



No. 6561.

No. 6560.	Boxwood Clinometer, 12 in. folding to 6 in., brass mountings, with one spirit level, compass and inclination scale, in leather case, ... Each,	$ 8 50
6561.	Boxwood Clinometer, like No. 6560, but with two spirit levels and with folding sights, in leather case, . Each,	11 50

The Inclination Scale marked on these Clinometers gives the value of any angle, as follows: The angle having been ascertained from the divided arc upon the instrument, refer to that degree in the column marked "Angle," and opposite in another column will be found the rise or fall in any given measured distance; for instance, say the degree shown on the divided arc is 18, opposite to this number on the scale is 3, thus indicating one part rise or fall in three, or 1 inch in 3 inches, or 1 foot in 3 feet.

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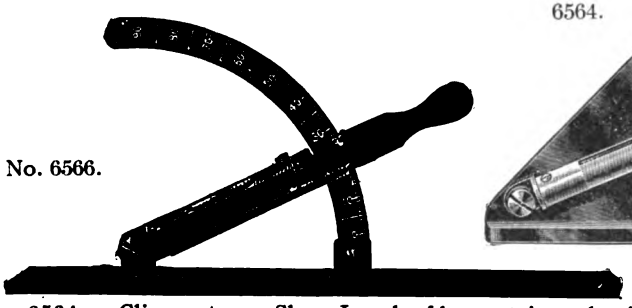
CLINOMETERS

Continued

6564.



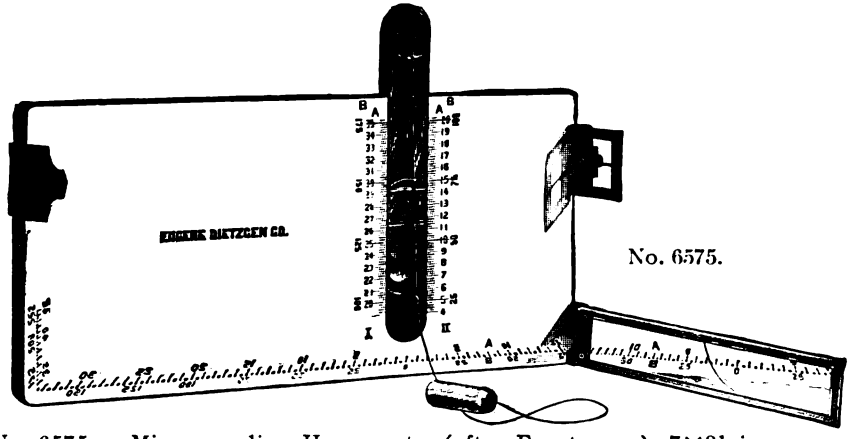
No. 6566.

No. 6564. Clinometer or Slope Level, of brass, triangular frame 4½ in. side, divided to ½ degrees, vernier reading to 3 minutes, in substantial case, ... Each, $10 00

6566. Clinometer or Slope Level, of brass, 8⅜ in. long, with folding arc and vernier reading to 3 min., in substantial case, Each, 12 00

HYPSOMETERS

For Measuring Heights of Trees, Buildings, etc.



No. 6575.

No. 6575. Mirror-reading Hypsometer (after Faustmann), 7×3¼ in., improved construction, of polished hardwood, graduations on white composition protected by coating against atmospheric influences, with folding sights and hinged mirror, with scale of heights on base of instrument and scales of distances on either side of groove in which the slide moves. The slide to which the plumb bob cord is fastened is provided with two reading lines to correspond with the two scales of distances; in pocket with flap and directions, . . Each, $ 6 00

6578. Mirror-reading Hypsometer (after Faustmann), like No. 6575, but made of brass, with graduations on silvered surface, with folding sights and hinged mirror; in pocket with flap and directions, ... Each, 18 50

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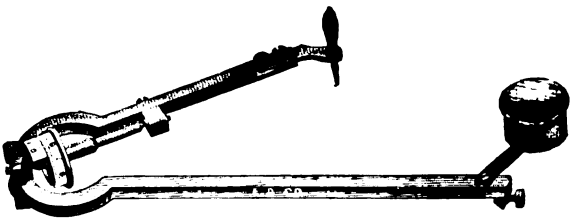
PLANIMETERS

These ingeniously devised instruments rank high among the various modern mechanical aids to the calculations and computations necessary in the work of Mechanical, Civil and Naval Engineers.

The Planimeter affords the most simple and convenient method of measuring the area of plane surfaces on drawings and plans. The accuracy of the results which can be obtained, when the instrument is carefully made and properly used, is so great that the Planimeter is now an indispensable aid to a constantly increasing number of the most progressive members of the engineering profession. In cases of irregular surfaces, the results obtained by the planimeter can not be equaled in accuracy by any compass and scale method of mensuration; and the time saved by using the instrument in such cases is very considerable. We carry in stock two types of planimeters, the Polar Planimeter and the Rolling Planimeter.

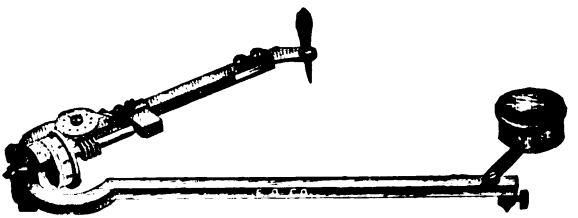
The Polar Planimeter, as its name implies, revolves with its tracer arm around a pole, and is therefore limited in its application by the length of the two arms, so that larger areas have to be measured in sections. The Rolling Planimeter differs from the Polar Planimeter in that it moves on two broad rollers. As the travel of these rollers is not limited, areas of any length, but not exceeding in width the movement of the tracer arm, can be measured in one operation.

Contrary to the prevalent idea, Planimeters are not difficult to use, but are very simple in operation; full directions accompany each one.



No. 6595.

No. 6595. Polar Planimeter, German Silver, fixed tracer arm, improved needle pole, measures in square inches only up to 10 square inches. By means of the vernier, inches, tenths and hundredths may be read off. Excellent for obtaining the areas of Steam Engine indicator diagrams, with directions, in case, ... Each, $13 50



No. 6598.

No. 6598. Polar Planimeter, Brass, fixed tracer arm, improved needle pole, like No. 6595, but with horizontal disc which records wheel revolutions up to 10, so that areas up to 100 square inches can be measured. Suitable for small drawings made to scales 1.1, 1:10, 1:100, etc., with directions, in case, ... Each, $15 50

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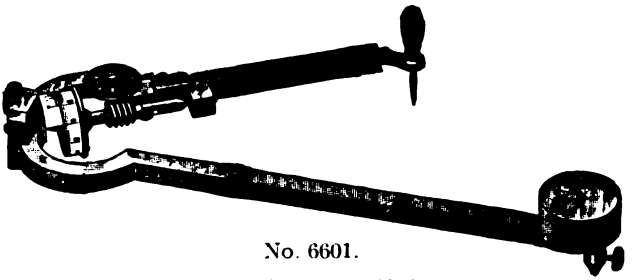
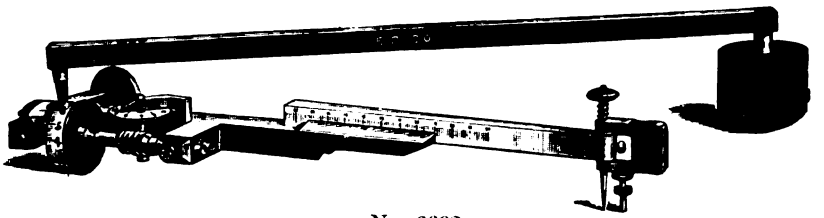


No. 6601.

Illustration one-half size.

No. 6601. Polar Planimeter, German Silver, fixed tracer arm, improved needle pole, for measurement of areas up to 100 square inches, with directions, in case, . . . Each, $19 00

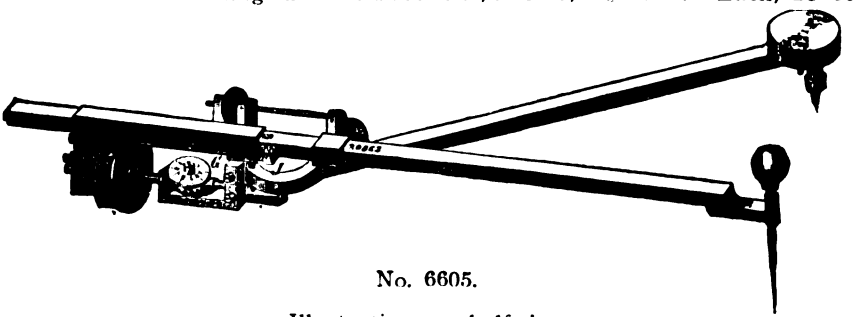


No. 6602.

Illustration one-half size.

No. 6602. Compensating Planimeter, German Silver and Brass, adjusted for one vernier unit only, on scale of 1:1, .01 square inch, suitable for use with scales of 1 in. = 10 ft., 1 in. = 20 ft., 1 in. = 50 ft., etc., improved winged handle and support, with testing rule and directions, in case, Each, $21 00

6603. Compensating Planimeter, German Silver and Brass, like No. 6602, but with larger roller and longer tracer arm; value of vernier unit on scale of 1:1, .02 square inches, with testing rule and directions, in case, . . . Each, 25 00



No. 6605.

Illustration one-half-size.

No. 6605. Polar Planimeter, German Silver, adjustable tracer arm, provided with index marks for different scales, as $\frac{3}{8}$ in. = 1 ft., $\frac{1}{4}$ in. = 1 ft., $\frac{1}{2}$ in. = 1 ft., giving areas in square feet; 6 in. = 1 mile, 1:2500, 1:500, giving areas in acres, with directions, in case, ... Each, $24 50

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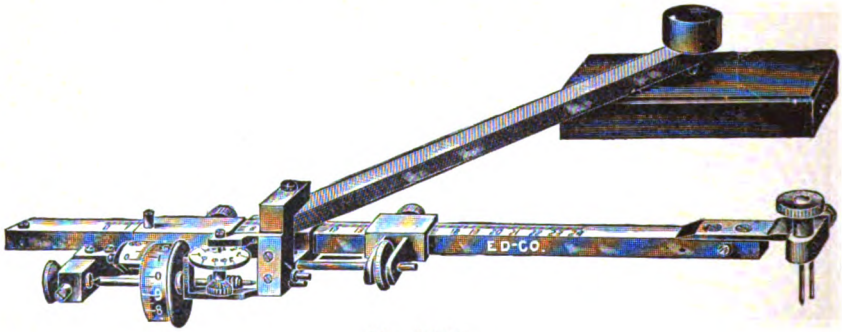
PLANIMETERS

Continued

No. 6606.

Illustration one-half size.

No. 6606. Polar Planimeter, German Silver, like No. 6605, but with special device for finding the mean height of indicator diagrams, with directions, in case, ... Each, $33 00



No. 6608.

No. 6608. Polar Planimeter of German Silver; the tracer arm is fully graduated, and by means of a vernier very fine settings for any scale in U. S. Standard, or any other measurement, can be obtained. The tracer arm also bears proportion marks for a number of scales for inches and metric measurements. Each Planimeter is furnished with a German silver testing rule to prove the accuracy of the instrument, and as an aid in adjusting it. Adjusting screws are provided to allow for corrections of instrumental errors. With pole weight and needle testing rule, fitted into morocco case with lock, in such a manner that the instrument may be laid in, set to any proportion; with directions, ... Each, $33 00

6609. Polar Planimeter of German Silver, like No. 6608, but with special device for finding the mean height of indicator diagrams; the points are protected by screw caps; with directions, in case, ... Each, 35 50

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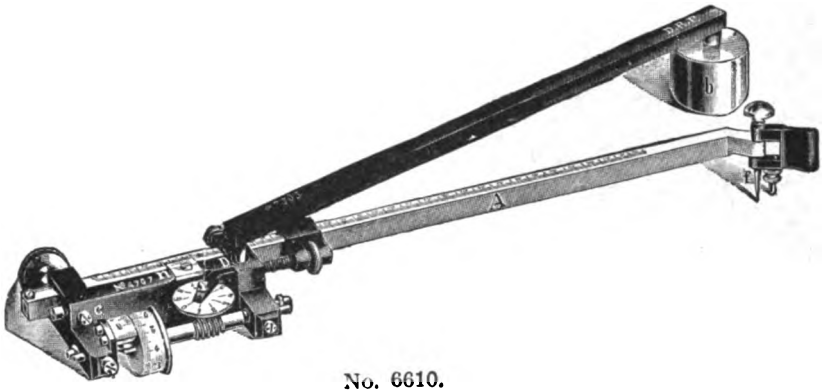


No. 6610.

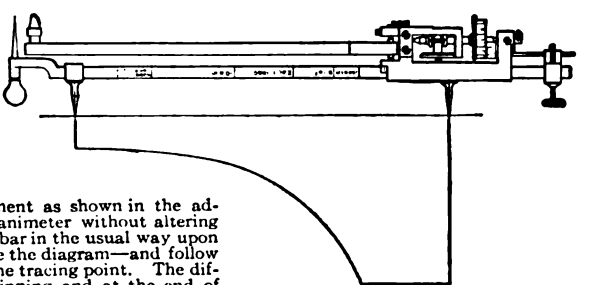
No. 6610. Compensating Planimeter, German Silver and Brass; adjustable tracer arm fully graduated, improved pole-weight; testing rule and table of settings for U. S. Standard measure, with directions, in case, ... Each, **$36 00**

6612. Compensating Planimeter, like No. 6610, but with adjustable pole-arm, with directions, in case, ... Each, **47 00**

Planimeters No. 6610–6612 are constructed in a novel manner. Instrument No. 6610 consists of two separate parts: the tracer arm and the carriage with measuring and recording wheels, and the pole-arm having the pole-weight at one end and a steel ball at the other end, which forms a ball joint with the wheel carriage. This construction gives the tracer-arm a motion of 180 degrees right and left, whereas with the usual Planimeters a motion of only about 90 degrees can be obtained. By measuring a diagram with the pole on the left and then again with the pole on the right side of the tracer-arm and taking the mean reading, all instrumental errors are compensated.

Instrument No. 6612 has an adjustable pole-arm bearing index marks for the different settings furnished with the instrument, and can be adjusted so that when the instrument is used with the pole inside of a figure, the constant is a round number 20,000, for any setting. It is used in the same way with the pole inside as with the pole outside, and by tracing the figure with the pole on the right and on the left of tracer-arm and taking the mean reading, large areas can be accurately measured.

DEVICE FOR FINDING THE MEAN HEIGHT OF INDICATOR DIAGRAMS



This device consists of two fine steel points, one attached to the upper side of the tracer-arm and the other to the surface of the carriage in which this arm slides. To find the mean height of indicator diagram take, by shifting the slide on the bar and keeping the planimeter upside down, the diagram lengthwise between the steel points on the upper side of the instrument as shown in the adjoining figure. Then place the planimeter without altering the relative position of slide and bar in the usual way upon the drawing—needle point outside the diagram—and follow the outline of the diagram with the tracing point. The difference of the readings at the beginning and at the end of the operation divided by 0.4 is then the mean height of the diagram, expressed in inches.

Example:

Second reading	2.361
First reading	— 1.913

0.4) 0.448 = 1.12 ins. = mean height.

If the diagrams for up and down stroke are measured jointly, divide by 0.8 instead of 0.4.

Mean pressure = Mean height × Scale of spring of indicator. Supposing the scale of the spring in the above example is 1" = 80 lbs. per sq. in., then

$$\text{Mean pressure} = \frac{0.448 \times 80}{0.4} = 89.6 \text{ lbs. per sq. in.}$$

The number of lbs. per inch of height being usually a multiple of 4, the arithmetical work is thus extremely simple.

For Instruments having this Device, see Nos. 6606 and 6609.

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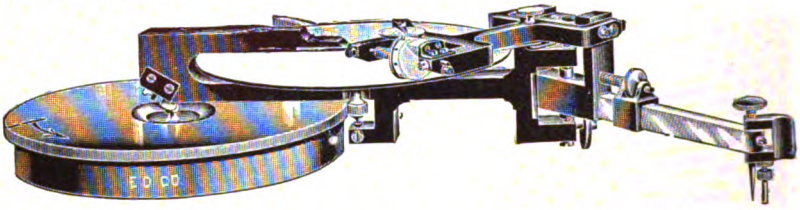
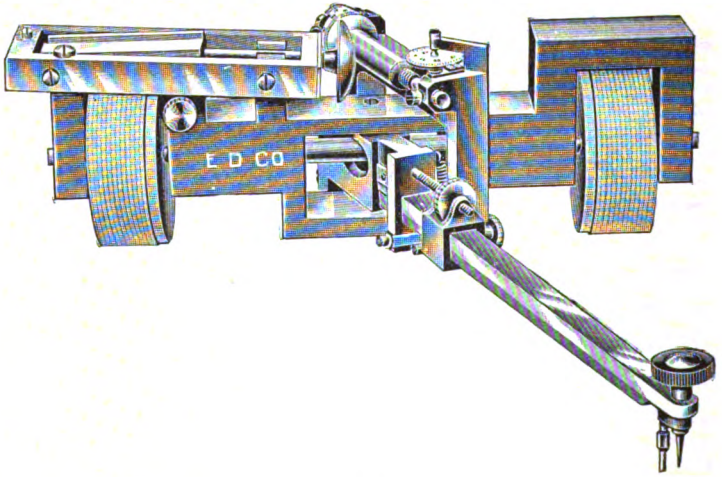
PLANIMETERS

Continued



No. 6615.

No. 6615. Suspended Ball Planimeter, German Silver and Brass, tracer arm 11¼ inches long, the pole arm 6¼ inches long, and the diameter of the toothed circle on the pole is 6¼ inches long. The angular motion of the tracer arm is about 90 degrees. Surfaces from 2½×4 in., to 7×10 in. can be measured without moving the pole. Instrument complete, in morocco case, and complete book of instructions, ... Each, **$85 00**



No. 6617.

No. 6617. Rolling Ball Planimeter, German Silver and Brass, having tracer arm 11¾ inches long, which can be increased by a lengthener to 19¾ inches. Its angular motion is about 90 degrees. The two rollers are made of exactly equal diameters, ensuring the motion of the instrument, as a whole, in a straight line A surface of any length and of a width of 20 inches can be measured with the 19¾ in. tracer arm. Instrument complete, in morocco case, and complete book of instructions, . Each, **$95 00**

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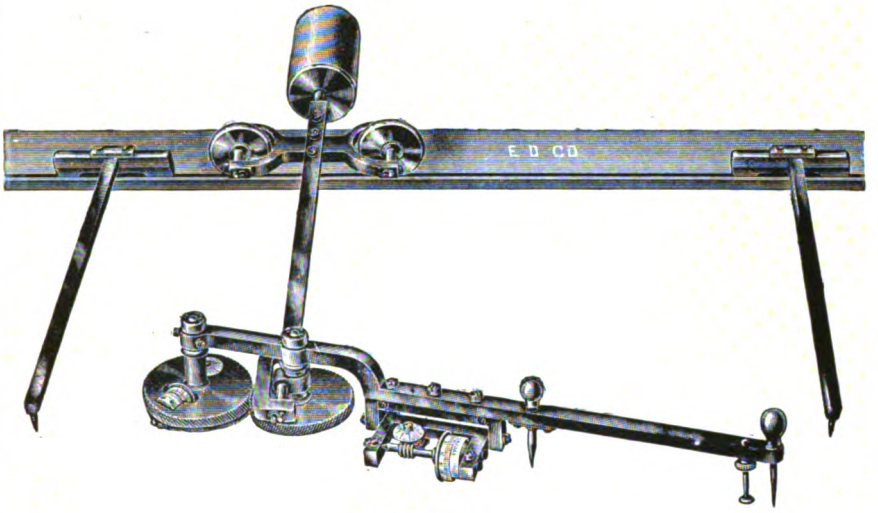
AMSLER'S MECHANICAL INTEGRATORS



No. 6625.

The Integrator may be used in Naval Architecture for measuring displacement, center of buoyancy, volume and center of holds, and for calculations of stability. In general work, this instrument is valuable whenever areas, moments, centers of gravity of diagrams, volumes of solids of rotation are to be determined. The Integrator is of simple construction, easily operated, and a complete book of Directions is furnished with each instrument.

No. 6625.	Amsler's Integrator, of German Silver, with two independent recording devices, one giving the moment of figure, the other the area; with two tracing points, two gauges for fixing axis of moments, with grooved steel rail, in polished hardwood case, with directions, ...	Each,	$110 00
6627.	Amsler's Integrator, like No. 6625, but of Brass, .	"	90 00

Dimensions:

Longitudinal range	26	inches.
Transverse range	15	"
Length of Rail	29	"
Distance from Rail to axis of moments	7½	"

Grooved Steel Rails of other length furnished to order.

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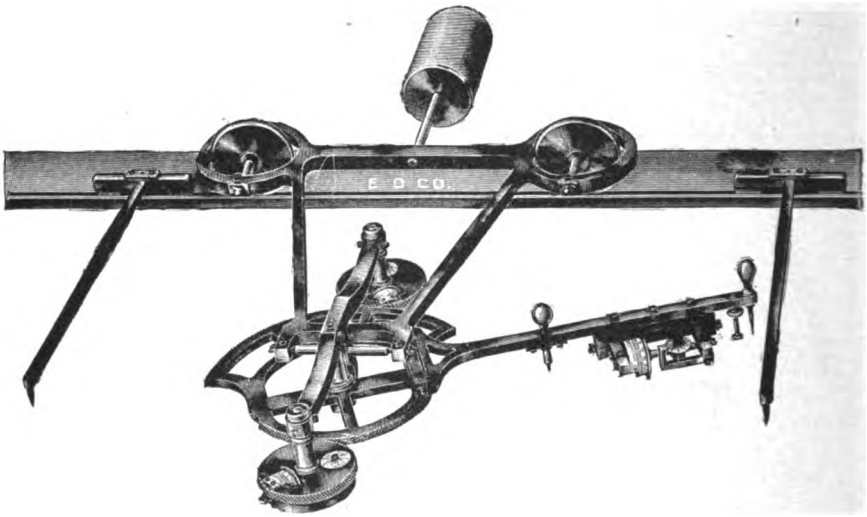

No. 6630.

This instrument has three recording mechanisms, giving the Area, Moment and Moment of Inertia; two tracing points and two gauges for adjusting instrument to axis of moments.

No. 6630. Amsler's Integrator, of German Silver, in polished hardwood case, grooved steel rail 59 inches long, in separate case, with complete book of instructions, . . Each, **$175 00**

6632. Amsler's Integrator, of Brass, in hardwood case, grooved steel rail 59 inches long, in separate case, with complete book of instructions, ... Each, **150 00**

Dimensions:

Longitudinal range, ...	50 inches
Transverse range, ...	13 "
Length of Rail, ...	59 "
Distance from Rail to axis of moments, ...	7½ "

Grooved Steel Rails of other length furnished to order.

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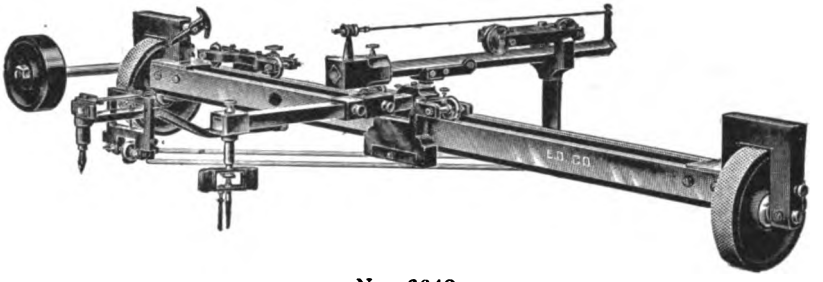
MECHANICAL INTEGRAPH



No. 6642.

The Integraph has proved to be of considerable aid to Civil and Mechanical Engineers and particularly Naval Architects. To the bridge builder it is invaluable, being a great help in ascertaining with great rapidity, the moments of tensile strength, etc., of a bridge.

With this instrument the different moments, curves of stability and inertia can be readily computed the same as is done with the integrator, but the integraph has one advantage; with the integrator it is necessary to compute the several curves point by point and to construct them by means of the computed points, while the integraph directly draws the curves on the paper, thus giving a graphical representation of the integration.

The manipulation of the instrument is simple. The operator draws the principal points through the outlines of the different curves to be calculated. The pen or pencil point automatically draws the integral lines and not only can the result be read off on the graduated bar, but the whole course of integration (differential curves), is shown.

No. 6642. Mechanical Integraph, German Silver and Brass, of improved construction and great accuracy. The instrument rests on two broad rollers. Movement of the balances is 26 centimeters, the basis may be set from 2 in. to 5 in., and has a lateral movement of 10.3 in. The bar is graduated to 1-10 inches with vernier reading to 1-100 inches and micrometer screw; pen and pencil point is attached to the sliding rack of the instrument. In walnut case with testing rule and directions, ... Each, **$175 00**

6645. Mechanical Integraph, like No. 6642, but with possible setting from 4 in. to 8 in., and with lateral movement of 20½ inches, ... Each, 240 **00**

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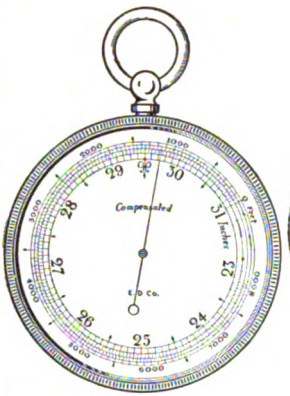
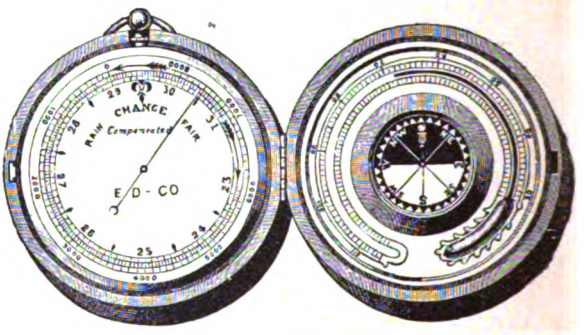
ANEROID BAROMETERS

For Measuring Heights and Atmospheric Pressure



No. 6705A.



6725.

In selecting an Aneroid Barometer it should be considered that as the normal Barometric Pressure at (50° F.) Sea Level is 29.92, and as the Altitude scale is graduated in relation to the Pressure scale so that 31 and 0 coincide and 29.92 and 950 coincide, the maximum altitude which the Barometer will indicate is decreased by 950 feet; thus, an Altitude scale graduated to read altitudes to 8,000 feet, will, under normal conditions, serve only where the altitude of the station does not exceed 7,050 feet.

When Aneroid Barometers are shipped or carried over higher altitudes than the pressure scale is graduated to read they are apt to become out of adjustment, and should always be tested before using.

Our Aneroids are compensated for temperature at a mean atmospheric temperature of 50° F.

No. 6700.	Watch pattern, gilt case, 1¾ in. diam., silvered metal dial, fixed altitude scale 8,000 feet, revolving pointer, compensated for temperature, in morocco case, . . Each,	$13 50
6705A.	Watch pattern, gilt case, 1¾ in. diam., of superior quality, silvered metal dial, fixed altitude scale 8,000 feet, revolving pointer, compensated for temperature, in morocco case, ... Each,	19 25
6705B.	Like No. 6705A, but altitude scale 3,000 feet, "	21 15
6705C.	" " 6705A, " " " 5,000 " "	20 10
6705E.	" " 6705A, " " " 12,000 " "	20 95
6705F.	" " 6705A, " " " 16,000 " "	22 55
6720A.	Watch pattern, nickel spring hunting case, 1¾ in. diam., silvered metal dial, fixed altitude scale 8,000 feet, revolving pointer, compensated for temperature, in morocco case, ... Each,	21 25
6720B.	Like No. 6720A, but altitude scale 3,000 feet, "	23 35
6720C.	" " 6720A, " " " 5,000 " "	22 10
6720E.	" " 6720A, " " " 12,000 " "	22 95
6720F.	" " 6720A, " " " 16,000 " "	24 55
6725.	Watch pattern, double opening gilt case, 1¾ in. diam., silvered metal dial, revolving altitude scale 8,000 feet, compensated for temperature, with small Singer pearl compass and thermometer on ivory in lid of morocco case, Each,	32 00

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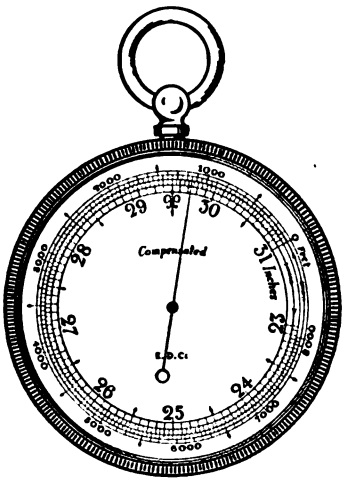
ANEROID BAROMETERS *Continued*

For Measuring Heights and Atmospheric Pressure



No. 6730A.

6740.

No. 6730A.	Pocket pattern, gilt case, 2½ in. diam., silvered metal dial, fixed altitude scale 8,000 feet, revolving pointer, compensated for temperature, in morocco case, . Each,	$20 50
6730B.	Like No. 6730A, but altitude scale 3,000 feet, . "	22 60
6730C.	" " 6730A, " " " 5,000 " . "	21 35
6730E.	" " 6730A, " " " 12,000 " . "	22 20
6730F.	" " 6730A, " " " 16,000 " . "	23 80
6735A.	Pocket pattern, ***aluminum case***, 2½ in. diam., silvered metal dial, fixed altitude scale 8,000 feet, revolving pointer, compensated for temperature, in morocco case, . Each,	24 25
6735C.	Like No. 6735A, but altitude scale 5,000 feet, with keyless action, ... Each,	28 00
6735D.	Like No. 6735A, but altitude scale 10,000 feet, with keyless action, ... Each,	28 00
6740.	Pocket pattern, gilt case, 2½ in. diam., compensated, silvered metal dial with an altitude scale of 5,000 feet in single 5 foot divisions in a repeating circle of divisions. The outside scale is divided to 10 feet, while the scale directly beneath it subdivides it to 5 feet divisions. No vernier or magnifier used. In pigskin case, . . Each,	50 00
6745A.	Aviation Barometer, brass case, 4½ in. diam., silvered metal dial, fixed altitude scale 18,000 feet divided to 25 feet, revolving pointer, compensated, with thermometer, in leather sling case, ... Each,	40 50
6745C.	Like No. 6745A, but with ***aluminum case***, . . . "	45 50
6745D.	Aviation Barometer, ***aluminum case***, 4½ in. diam., silvered metal dial, fixed altitude scale 18,000 feet divided to 25 feet, revolving pointer, compensated, with thermometer. In this instrument aluminum is used in the movement wherever practical, thus reducing the weight. In leather sling case, ... Each,	49 50

The great interest shown in Aviation has created a demand for Barometers suitable for this purpose. The above Aviation Barometers will be found to meet all the requirements of Aviators; they are accurate, easily and quickly read, and sensitive. While made principally for Aviators' use, they are well adapted for all general aneroid work.

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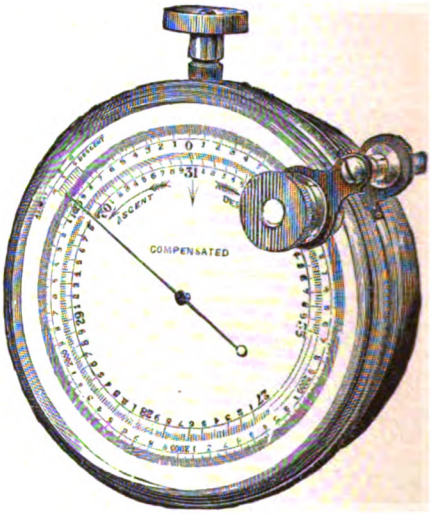
ANEROID BAROMETERS *Continued*

For Measuring Heights and Atmospheric Pressure

No. 6760.



6769.

No. 6760.	Surveying Barometer, bronzed case, 3 in. diam., best engraved silvered dial, graduations on raised ring, fixed altitude scale 5,000 feet, vernier scale moved by rackwork motion, reading to 1 foot, compensated for temperature, adjustable reading lens, in leather sling case, .	Each,	$63 00
6761.	Like No. 6760, but altitude scale 10,000 feet, with vernier reading to 2 feet, ...	Each,	65 70
6762.	Like No. 6760, but altitude scale 16,000 feet, with vernier reading to 2 feet, ...	Each,	69 40
6763.	Like No. 6760, but ***aluminum case,***	"	72 00
6765.	Surveying Barometer, bronzed case, 5 in. diam., best engraved silvered dial, graduations on raised ring, fixed altitude scale 5,000 feet, vernier scale moved by rackwork motion reading to 1 foot, compensated for temperature, adjustable reading lens, in leather sling case, .	Each,	68 00
6766.	Like No. 6765, but altitude scale 10,000 feet, with vernier reading to 2 feet, ...	Each,	70 70
6767.	Like No. 6765, but altitude scale 16,000 feet, with vernier reading to 2 feet, ...	Each,	74 40
6768.	Like No. 6765, but ***aluminum case,***	"	81 50
6769.	Mining Barometer, bronzed case, 3 in. diam., best engraved silvered dial, graduations on raised ring, fixed altitude scale 2,000 feet below and 4,000 feet above sea level, vernier scale moved by rackwork motion reading to 1 foot, compensated for temperature, adjustable reading lens, in leather sling case, ...	Each,	63 00
6770.	Mining Barometer, like No. 6769, but 5 in. diam.,	"	68 00

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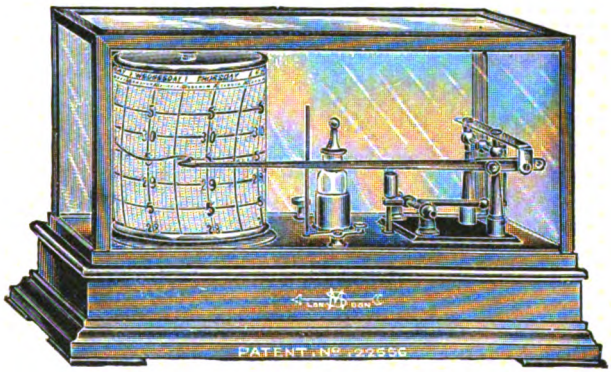
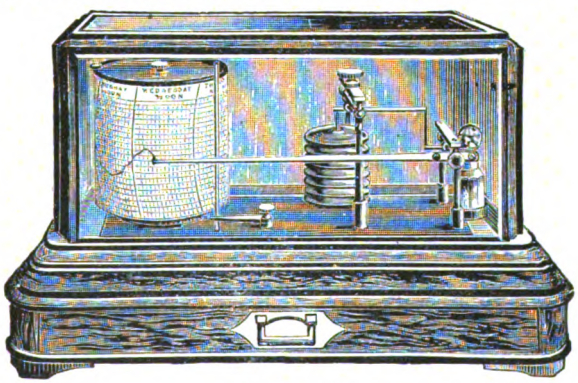
BAROGRAPHS AND THERMOGRAPHS

These instruments are constructed to record weekly the varying atmospheric and temperature conditions by means of a German silver arbor connected at one end with the Aneroid Barometer, and carrying at the other end a pen that records automatically on a revolving graduated chart.



No. 6800.

No. 6800. Barograph, simplified form, recording one week. The movement of the recording pen is worked by a large vacuum chamber concealed in the base of the instrument. The most desirable and popular priced barograph on the market. Clock and charts are identical to those of the high priced instruments. Complete with ink and a year's supply of charts, in fumed and waxed oak case, ... Each, $40 00



No. 6802.

No. 6802. Barograph, recording one week by two hour intervals from 28 to 31 in. Pen arm controlled by a series of 8 vacuum chambers and recording on a revolving drum 3½ in. diameter, with Seth Thomas clock movement, which has exposed regulations to permit re-adjustment of the clock rate if necessary. In finely finished mahogany case with beveled plate glass and drawer for used and unused charts, complete with ink and a year's supply of gummed and perforated charts, Each, $57 00

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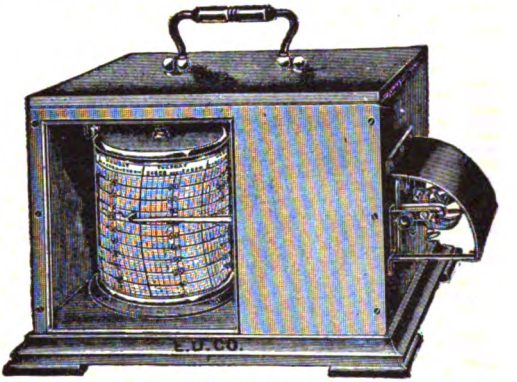
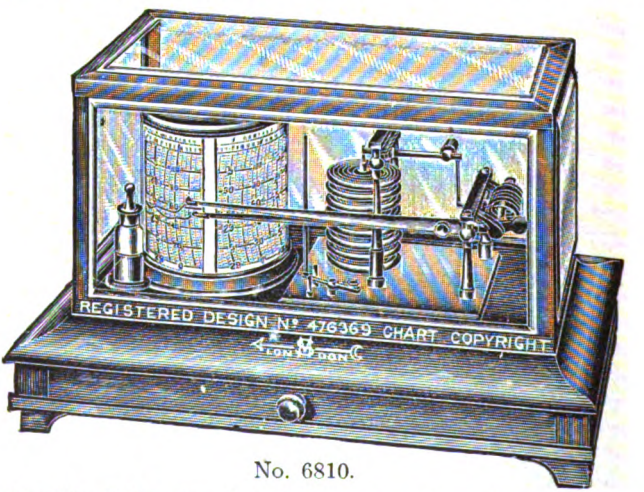
BAROGRAPHS AND THERMOGRAPHS *Continued*



No. 6806.

No. 6806. Thermograph, recording one week, from 0 to 100 degrees Fahrenheit, by 2 degrees. The movement consists of a spiral lamina of non-rusting material which is exposed to the atmosphere at the end of the case. It is extremely sensitive and is not affected by vibration, as the pen arm is in direct connection with the coil. In copper case, complete, with ink and a year's supply of charts, ... Each, $43 00



No. 6810.

No. 6810. Combined Barograph and Thermograph, with non-corrosive thermometric coil, both recording on one chart for one week. The barograph chart range is from 28 to 31 in.; thermograph chart from 0 to 120 degrees by 2 degrees. The non-corrosive steel coil is superior to the old form of bourdon springs filled with alcohol, the porosity of which permits the evaporation of the alcohol. Complete with two different colored inks (blue for the barograph and green for the thermograph), and a year's supply of charts. In finely finished mahogany case with beveled plate glass and drawer, . . . Each, $85 00

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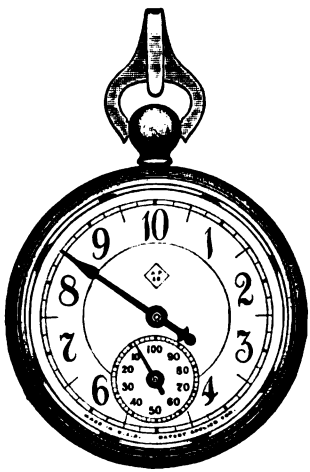
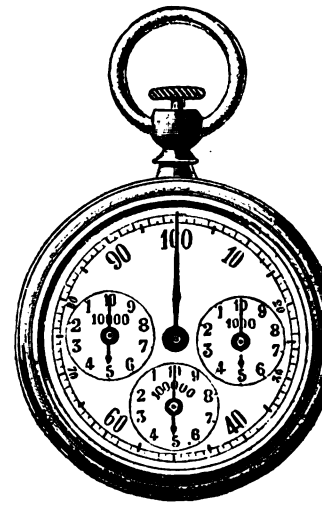
PEDOMETERS AND ODOMETERS



No. 6901B.



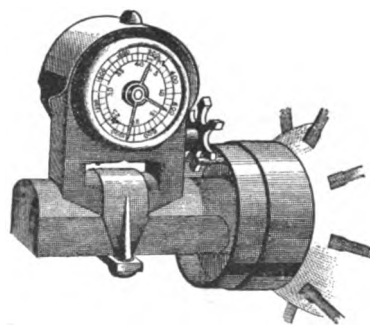
6904.

No. 6901A. Pedometer, watch pattern, nickel case, registering distance walked to 10 miles, ... Each, $ 1 25

6901B. Pedometer, watch pattern, nickel case, registering distance walked to 100 miles, ... Each, 1 25

6903. Passometer, watch pattern, nickel case, with 3 hands, registering 25,000 steps, ... Each, 6 00

6904. Passometer, watch pattern, nickel case, with 4 hands, registering 100,000 steps, ... Each, 6 50



No. 6907.

No. 6907. Improved Odometer, registers distance traveled to 1,600 miles and repeats; rings a small bell as each mile is passed, ... Each, $ 5 00

This Odometer can be used for any kind of vehicle. The illustration shows method of attaching to axle with pin in hub. They are made for wheels of any size from 28 to 54 in., varying every half inch. In ordering it is necessary to state the *exact diameter* of the rear wheel of carriage, from outside to outside of tire.

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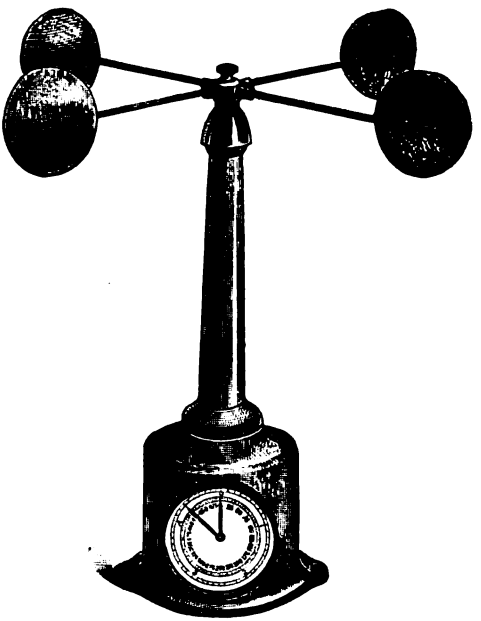
ANEMOMETERS

Or Wind Gauges.

For measuring the velocity of air currents in mines, sewers, hospitals, public and private buildings, etc. Each instrument is tested separately, and has a correction table for variations, showing the amount of air, in feet, to be added and deducted.



No. 6908.

No. 6908. Robinson's Improved Anemometer, ... Each, $30 00

The four hemispherical cups are set in rotation by the motion of the air and the number of revolutions is recorded by the mechanism in the base of the instrument. The vertical axis communicating the motion of the cups to the recording mechanism runs in ball bearings, which insures a sensitive and delicate movement. The results of observations can be read off on an enameled dial on the face of the base. The outer circle of this dial registers 5 miles by $\frac{1}{10}$ mile and the inner one up to 500 miles. The two hands can be set to zero.

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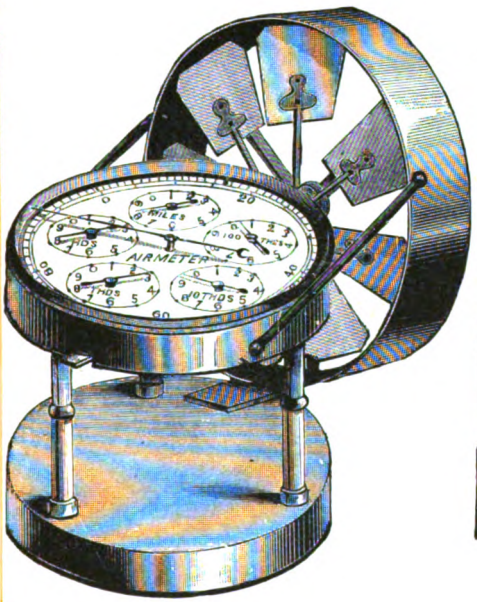
ANEMOMETERS *Continued*

Or Wind Gauges.



No. 6910.

6912.

No. 6910. Portable Air Meter, diameter of fan wheel 2¾ inches, with disconnector. The indications are obtained by the revolution of a series of fans, acting first upon the large dial, divided to 100 feet, and then successively by a train of wheels on the indexes of five smaller dials, recording respectively 1,000. 10,000, 100,000, 1,000,000 and 10,000,000 feet, or 1,893 miles; in leather case, ... Each, $24 00

6911. Same as No. 6910, but with sand glass timer, in leather case, ... Each, 27 50

6912. Portable Air Meter, with disconnector, 4 dials recording to 100,000 feet, with key for zero setting, in leather case, Each, 24 00

6913. Same as No. 6912, but with sand glass timer, in leather case, ... Each, 27 50

The Timer consists of a sand glass which acts as a stop and also serves to easily compute the time the current takes in passing through the fans.

We have the best facilities for testing and repairing Anemometers.

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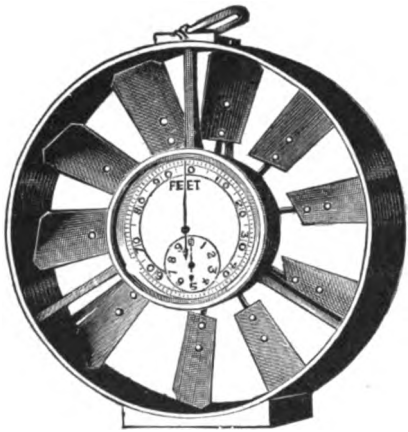
Or Wind Gauges.



No. 6922.

6935.

No. 6922. Biram's Anemometer, 2 dials, 4 in. diameter, reading to 1,000 feet, with disconnector, in leather case, . . . Each, $22 50

6924. Biram's Anemometer, 4 dials, 4 in. diameter, reading to 100,000 feet, with disconnector, in leather case, . Each, 23 50

6928. Biram's Anemometer, 2 dials, 6 in. diameter, reading to 1,000 feet, with disconnector, in leather case, . . . Each, 26 00

6930. Biram's Anemometer, 4 dials, 6 in. diameter, reading to 100,000 feet, with disconnector, in leather case, . Each, 28 50

6932. Biram's Anemometer, 6 dials, 6 in. diameter, reading to 10,000,000 feet, with disconnector, in leather case Each, 32 00

6935. Anemometer, watch pattern, 2 in., registering to 1,000 feet; nickel plated hunting case, with stop. When open the two covers form a base for the instrument; in morocco case, Each, 30 00

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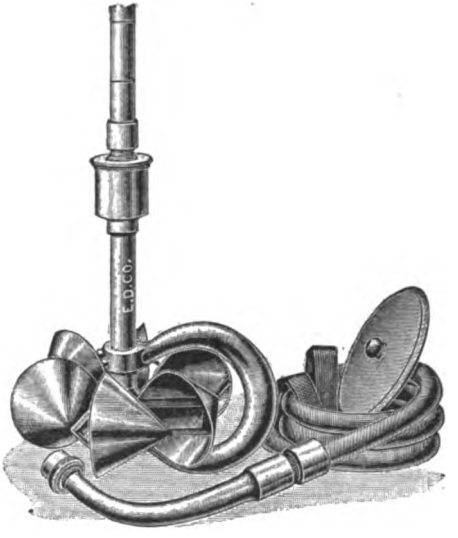
CURRENT METER

The increased demand for a high grade Current Meter, especially designed for use in irrigation work to measure the speed of flowing water, has led us to list the following Acoustic Meter, which is superior to other makes on account of its accuracy and simplicity of construction. It is very compact and portable, and possesses the desirable advantages of having no exposed mechanism; no delicate parts to get out of order; continuous reliability in action; and rigidity combined with lightness.

The revolutions of the bucket wheel are indicated by a small hammer, which is connected with the mechanism and strikes against a thin diaphragm, one blow for every ten revolutions. The recording mechanism is enclosed in the stem of the meter and is absolutely protected from injury. The meter is suspended by a tube, by which it is held in the stream during observations, and through which the sound of the blows on the diaphragm is conveyed to the ear by means of an ear-piece attachment. As this attachment is fastened to the operator's head, both hands are left free for the manipulation of the meter.

By use of a Reduction Table supplied with the meter, results obtained may be readily reduced.



No. 6950.

No. 6950.	Acoustic Current Meter, including two 2-foot lengths of graduated brass tube, tool accessories, and extra pivot bearing, in strong wooden box with lock and strap,	Each,	$50 00
6950A.	Extra Graduated Brass Tube, 2 feet long, . .	"	2 50
6950B.	Canvas Case, for 2, 3 or 4 lengths of tube, . .	"	2 50

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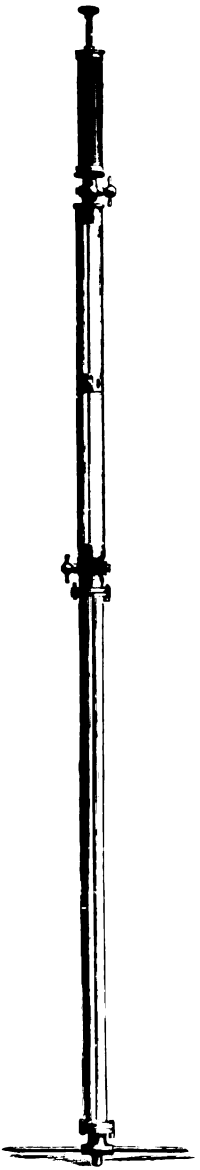
HYDROMETRIC TUBE

(Pitot's Tube.)



This is another type of instrument for measuring the velocity of currents, and consists, principally, of two parallel tubes connected at the top, the lower ends being bent at right angles so that the openings are in opposite directions.

To measure the velocity of currents, the instrument is immersed into the stream directing one opening against the stream, thus causing the water to rise higher in the up stream tube than in the downward directed one. The difference in height of the two water columns is the velocity, which is proportional to the square of the speed in meters per second.

As it will be necessary for the convenient observation of the height of the water in the tubes, to bring the water above the surface of the stream, a small pump has been attached to the top of the tubes with which the air pressure above the water columns can be reduced; this permits the water to rise in the tubes proportionally without affecting the difference of height in the least. The instrument is further provided with a faucet below the glass tubes with which the flow of water can be shut off as soon as the water columns have assumed a steady position. It may then be withdrawn from the stream to a convenient position, and with the aid of the sliding sight the readings of both tubes can be taken with the mm. scale provided for that purpose.

The Hydrometric Tube is particularly well adapted for use in shallow waters where the Current Meter, on account of its size and construction, cannot be used advantageously.

With each instrument is furnished a correct formula for determining the velocity, where:

V=velocity in meters per second.
h2=height of water column in mm.
h1= " " " " " "

Thus $V=0.14\sqrt{h2-h1}$

No. 6968. Hydrometric Tube, in polished hardwood case, weight complete about 20 pounds, ... Each, **$110 00**

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RAIN GAUGE

No. 6976.

The Rain Gauge illustrated above is known as the "tilting bucket" rain gauge. No measurement is necessary, as the rain is collected in the 8 in. receiver and is taken through a small pipe and dropped into one side of a bucket. When a given amount of rain has collected in the bucket (0.01") the weight of the rain on the laden side causes it to overbalance and, by a mechanical arrangement, the hand moves 0.01" at each operation. The rain, still passing through the receiver, is collected in the opposite bucket; when that has received the given amount, the same operation is repeated. Its great advantage is that it is zero setting, making it particularly useful to anyone desiring to keep a record of rain-fall by the month or week, as by the zero setting device no calculation is necessary. The dial registers 1 inch in 1-100th inch; the second or smaller dial reads to 12 inches.

No. 6976. Zero-setting Rain Gauge in Japanned Metal Case, 8×10 in., Each, $27 00
6978. " " " Copper Case, 8×10 " " 32 00

An advantage which applies to this gauge is that the collecting funnel can be placed at a distance from the gauge, and connected to it by a small pipe, the instrument being placed within a house or shelter.

STOP WATCHES

No. 6988.

No. 6988. Stop Watch, stem-winder, nickel-plated case, porcelain dial, registering to 30 minutes by ⅕ seconds; fly-back, engaging and disengaging mechanism, ... Each, $5 00

6990. Stop Watch, like No. 6988, but with a side lever by means of which it is possible to cause the hand to fly back to zero and to start automatically and instantaneously, ... Each, 7 00

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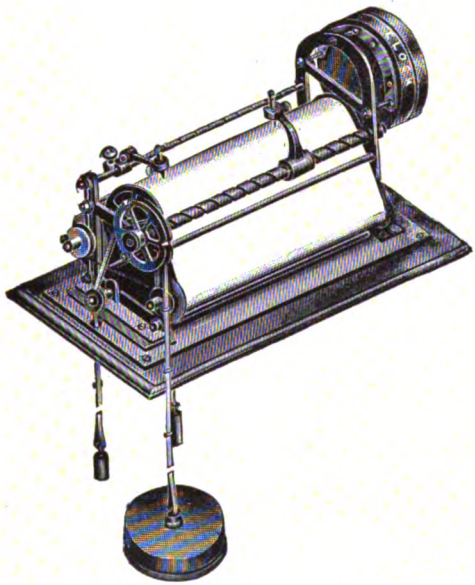
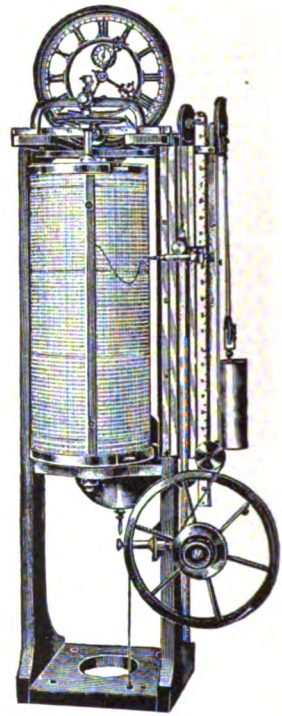
SELF-REGISTERING TIDE GAUGES



No. 6995.



No. 6997.

No. 6995. Self-Registering Tide Gauge or Marometer, with clock and all accessories, in nicely finished pine case, Each, **$125 00**

This instrument is applicable for analogous observations in branches of Hydraulic Engineering, as in Fresh Water Rivers, Canals, Aqueducts, Reservoirs, Sewers, Deep Wells, etc., and wherever it is required to obtain an accurate record of periodical changes in the level of any liquid.

By a pencil a curve is traced on paper, the abscissae of which represent time while the ordinates represent the rise and fall of level.

The gauge occupies but little space and can be removed, transported and reset without much difficulty. It is compact, strong and reliable, and with ordinary attention will not get out of order. The exposed parts are of brass and phosphor bronze, and will therefore not be affected by a moist atmosphere.

For recording, either single sheets or a continuous strip of paper may be used. The recording cylinder, moved by a clock, is adapted for paper 13 in. wide and makes one revolution in 12 hours, recording time to a scale of one inch per hour and the change of level to a scale of one inch per foot, providing for a variation of 12 feet in level.

No. 6997. Self-Registering Tide Gauge, with fine regulator clock running eight days, with accessories, in case having glass paneled door, ... Each, **$170 00**

The balanced float is attached to a rack and pinion which imparts the motion to the pencil as the tide rises and falls. The cylinder, making one revolution in seven days, carries the graduated chart upon which the curve is automatically drawn.

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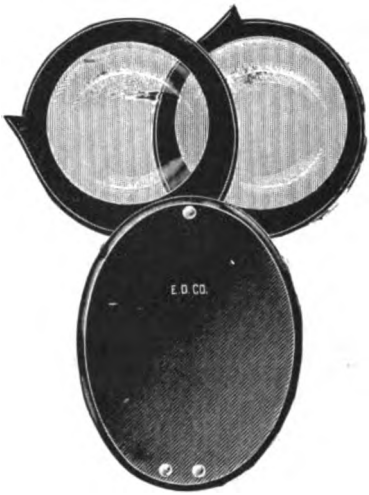
POCKET MAGNIFYING GLASSES

No. 7150.



7152.

No. 7150.	Mounted in rubber,	1	lens,	1	in.	diameter,	.	.	Each,	$0	35
7151.	"	"	1	"	1½	"	"	. . .	"		55
7152.	"	"	2	"	1	"	"	. . .	"		60
7153.	"	"	2	"	1½	"	"	. . .	"	1	00

No. 7170.

7172.

No. 7170.	Mounted in metal,	nickel	plated,	1	lens,	1	in.	diam.,	Each,	$0	75
7171.	"	"	"	2	"	1	"	"	"	1	00
7172.	"	"	"	3	"	1	"	"	"	1	30

Nos. 7170-7172 have a very good magnifying power, and are especially adapted for reading graduations on surveying instruments. Their metal mounting insures great durability.

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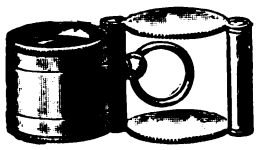
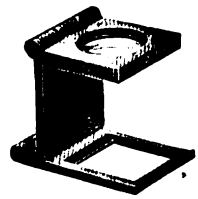


No. 7230.



7251.

7261.

No. 7230.	Coddington Lens, metal folding frame, nickel plated, ½ in. diameter, ... Each,	$1 50
7232.	Coddington Lens, metal folding frame, nickel plated, 1 in. diameter, ... Each,	2 10
7234.	Coddington Lens, metal folding frame, nickel plated, 1⅜ in. diameter, ... Each,	3 60
7251.	Thread Counter, brass frame, ½ in. field, . . . "	30
7261.	Magnifier, on 3 legs, brass, screw adjustment, 1 in. diam. "	55

READING AND PICTURE GLASSES

Best quality, mounted in nickel-plated frames, polished wooden handles.

No. 7280.

No. 7280.	Size	2	2½	3	3½	4	4½	5 in
	Each, ...	$0 55	80	90	1 20	1 60	2 20	2 75

Reducing Glasses, mounted in nickel-plated frames, polished wooden handle.

7285.	Size	2	3 in
	Each, ...	$1 10	1 80

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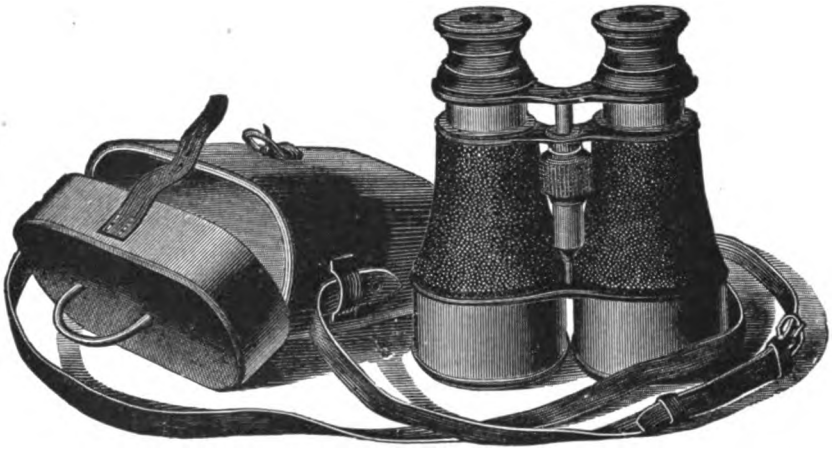
FIELD AND MARINE GLASSES

Of Best Quality.

U. S. Signal Day and Night Glasses, adopted by the U. S. Government.



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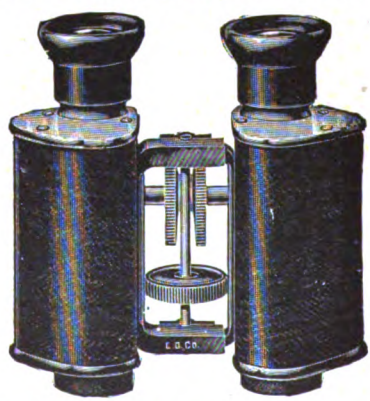

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